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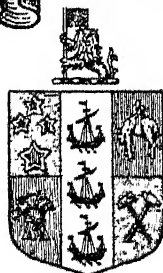
THE BRITISH EMPIRE

A Survey in 12 Volumes—each self-contained

Edited by

HUGH GUNN

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1955



ONWARD

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INTRODUCTION TO THE SERIES

A WORD is necessary as to the origin and object of this series. The Management of the British Empire Exhibition (1924), in the early days of its organisation, approached the Imperial Studies Committee of the Royal Colonial Institute for advice and assistance in connection with the educational aspect of the Exhibition's work. The Editor of this series, who is a member of that Committee, happened during a period of enforced leisure to be spending a good deal of his time at the Institute, chiefly in its delightful Library. On its shelves he found entrancing reminiscences or records of men who went forth from these islands as Pioneers to brave the perils of uncharted seas and the dangers of unknown lands, inspired more by the spirit of adventure inherent in the race than by any calculated design for personal gain or lust for the acquisition of new territories. From these volumes could be traced the beginnings and gradual growth of remote colonies, through the early stages of awakening public interest, followed perchance by apathy or neglect until the advent of some world movement brought them into the fierce light of economic and international importance.

Though there lay upon the shelves an immense mass of valuable literature on almost every phase of Imperial work, it became apparent to the Editor that there was no series of volumes which gave a complete survey of the history, resources, and activities of the Empire looked at as a whole. He felt that there was need for a

series which would provide the ordinary reader with a bird's-eye view, so to speak, of these manifold activities.

The time seemed appropriate for such a survey. The Empire had emerged victorious from the greatest of wars. The Dominions which had contributed so magnificently to the victory had sprung, as it were, at a bound not only into the consciousness and acknowledged status of full and equal nationhood with the Mother Country, but also into definite recognition by Foreign Powers as great and growing World-Forces.

The decision to hold in London an Exhibition in which the vast material resources and industries of the Empire would be brought vividly before the public seemed also to demand that there should be a record and survey of the growth and development of this far flung congeries of countries and peoples that are called the British Commonwealth of Nations.

The Editor accordingly consulted some of his friends, and was fortunate in securing their assistance and advice. The Management of the British Empire Exhibition welcomed the scheme as supplementing from the intellectual side what the Exhibition was doing from the material aspect. He has also been fortunate in obtaining the co-operation, as authors, of distinguished men, many of whom have played a foremost part in the public life or administration of the territories concerned, and all of whom have had wide personal knowledge and experience of the subjects which they treat. The Editor's thanks are especially due to these authors. They have undertaken the work from a sense of duty and from a desire to provide, at an important stage in our history, authoritative information regarding the great heritage that has been bequeathed to us, not only unscathed

but strengthened by the stern struggle through which it has passed.

Each volume is self-contained and deals with a special aspect of the Empire treated as a whole. The volumes are, however, co-ordinated as far as possible, and give, it is hoped, a comprehensive survey of the Empire.

The writers have had complete freedom as regards the statement of their views and it is to be understood that neither the Editor nor his advisers are responsible for such individual expressions of opinion.

The late Sir George Parkin was deeply interested in the scheme, and, but for his lamented death, would have contributed a volume to the series.

The Editor, in conclusion, desires to express his thanks to Lord Morris, and to Sir Charles Lucas, especially the latter, for the benefit of their advice and ripe experience.

HUGH GUNN,
General Editor.

LONDON, *April*, 1924.

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THE RESOURCES OF THE EMPIRE AND THEIR DEVELOPMENT

THE RESOURCES OF THE EMPIRE AND THEIR DEVELOPMENT

by

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INTRODUCTION

THE development of the natural resources of the empire is a matter of such vital concern to the well-being of each of its component parts that every effort should be made to extend production, not only in our tropical possessions, but also in the great self-governing Dominions. The increase of inter-imperial trade is only one of the phases in the fight for new markets, but it is a matter of much greater importance than is generally recognised, and it cannot be left to the haphazard influence of chance. Production is the keynote of our imperial prosperity, whether it be in Great Britain or elsewhere. This book is designed to show, therefore, the increase in overseas production during recent years and the possibilities of future extensions.

The immediate result of the war was a quickening of the economic pulse in many of the overseas Dominions and Colonies. The closing of foreign avenues of supply led to the development of new sources of raw materials and the growth or establishment of fresh industries in countries that hitherto had been emerging, more or less quickly, from the pastoral and agricultural stages of development. The mother country was forced to rely to a greater extent upon the resources of the overseas domain and consequently to seek new markets for her manufactured goods in the chief countries of supply.

The feverish activity of war-time production was followed by a short period during which the demand for goods from nations hungry to replenish their stocks, after the lengthy interruption of normal relations, led to the ill-founded belief that a period of increased prosperity was about to emerge from the night-time of

war. As a matter of fact a time of universal depression, not previously experienced in this generation, almost inevitably followed the unnatural stimulus provided by the first two years of peace, and an almost unprecedented slump in the world-markets caused statesmen and economists to take stock of the empire's trade and to inquire whether it was not possible to develop new avenues of expansion as well as to tap fresh sources of supply.

Even a brief examination of the whole question, in view of the collapse of European trade, made it evident that the United Kingdom in common with the rest of the empire must follow a policy of development within the empire if the disastrous set-back in trade were not to leave its mark in the permanent impoverishment of the mother country, the decrease of its manufactures, and the loss of much of its former prosperity. It became clear that the best way to avert this danger was by developing the enormous latent resources of the overseas portions of the empire so that every available source of supply and every possible market should be put under toll for the ultimate benefit of the whole community.

The principal purpose of this book is to demonstrate that there are immense natural resources in the British Empire ready for development, and to show that while it is essentially desirable that foreign trade should be expanded in every direction, it is equally, and perhaps more, necessary that inter-imperial commerce should be extended by a policy of co-operation between the different parts of the empire.

There are many ways of achieving this object without the operation of high, or even preferential, tariffs, desirable as the latter appear to be to a not inconsiderable part of the thinking community. It is not necessary to express any definite opinion as to the desirability or otherwise of tariffs for the development

of trade or for the protection of established or infant industries in a book that is concerned almost solely with productive effort in the overseas territories of the Crown. It is, however, essential to a proper understanding of this question that the reader should realise the great potentialities of the empire and should understand that its resources are as yet, taken as a whole, only partly developed and represent only a small proportion of the enormous possibilities of a not distant future. Some of the new nations that have arisen within the Britannic orbit may become, even before the present century has passed, almost as important as the mother country. It is to this possibility and to the great latent riches of our tropical possessions that statesmen and economists should direct their attention.

Hitherto there have been very few books giving in a concise and handy form particulars regarding the chief products of the empire. It is to be hoped that the present volume may fill a distinct gap in the literature relating to the development of our imperial resources. It should form an introduction to a complicated, but highly important, subject, and should enable the reader to realise how vast are the developed and undeveloped resources of the empire and how dependent the United Kingdom is upon supplies from overseas for the maintenance of its economic position. The final chapter, in view of the development of manufacturing industries in the Dominions, is possibly worth consideration. In any case it seems to represent the logical outcome, so far as the Dominions are concerned, of the development of their agricultural and mineral resources.

EVANS LEWIN.

February 21, 1924.

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CHAPTER I

CONSTRUCTIVE IMPERIALISM

THE proper development of the natural resources of the British Empire is one of the most important problems of the present century. Upon a correct application of scientific and economic principles to the solution of this problem, depend not only the prosperity of the whole Commonwealth and that of each individual part, but also its continued existence as an empire. The problems connected with this development are many and varied. They range from actual methods of cultivation in the best and most scientific manner, to the quickest and most efficient means of bringing the raw materials of commerce to the markets ; from the manufacture of the raw product into the finished article to its distribution at the cheapest rate to the consumer ; from the fostering or protecting of industry, both agricultural and manufacturing, by well-designed tariffs to the support of planters or manufacturers by public credits or by means of agricultural and mercantile banks ; and from the question as to whether tropical countries should be exploited by large commercial corporations or developed by means more appropriate to the encouragement of an indigenous civilisation, or, in other words, by methods of native cultivation and ownership. In fact the problems connected with such economic development are so many and so interwoven in the fabric of modern existence that there is scarcely an art or a science that does not directly contribute to the solution of the question. Medicine, chemistry, meteorology, botany, geology, zoology, engineering, and social and political science are each directly concerned, and it is only through the recognition by a vigorous and energetic people of the inter-dependence and complexity of all questions of imperial economics that the British Empire will be enabled to maintain its position during the future era of economic advance.

The full realisation of this inter-dependence has been a comparatively late development of political and economic thought. The times are not far distant when the trader and the merchant were practically left to their own devices with little or no assistance from the State, which did not realise, and certainly did not practise, its duties as doctor, scientist, or botanist. The State, as such, held aloof from the active encouragement of agricultural, commercial, or industrial enterprise in the overseas portions of the British Empire. Its main duty as conceived by economists of the old school was to govern and not to develop, and to interfere as little as possible in matters then entirely within the domain of private enterprise. Only the gradual awakening due to the realisation that all was not well with the body economic, and the knowledge that while England was a manufacturing country the outside world and the overseas empire upon which its prosperity was primarily dependent contained countries of natural production whose development also needed attention, broke down the system of frigid aloofness and non-interference which marked generally the policy of the State. Having reduced her home system of agriculture to a condition of almost hopeless inferiority in her attempt to secure and maintain a monopoly of manufacturing industry, Great Britain, so soon as she began to realise that her industrial supremacy was being threatened, commenced to consider the possibility of entering upon new markets by developing her overseas estates. It was as she passed from the period of world economics, when all countries were equally her store-houses and her markets, into the age, more practical and more fruitful, of imperial economics, that the old theory of the State was shattered, and governments began to realise the wider duties that were being thrust upon them. The threatened loss of markets and the rise of new manufacturing competitors roused the nation to a knowledge of its economic perils and led men to appreciate the value of the great imperial heritage across the seas.

It is unnecessary here to describe the earlier methods employed in developing the productive capacity of the British Empire. It is sufficient to state that under the old plantation system all overseas portions of the empire were regarded as so many agricultural estates from which

such raw materials as did not compete with the produce of the mother country could be shipped to England. Enterprise overseas was entirely private, and whatever encouragement it received from the government was limited by the understanding that on no account should it compete with the recognised industries of England. British planting enterprises in the American colonies and in the West Indies received substantial protection in the home markets, but trade was never free, and there were numerous and harassing restrictions on the natural flow of commerce which frequently counteracted the benefits received from the political and economic connection with the mother country. At no time prior to the downfall of the old mercantile system was there any definite recognition of the fact that colonies should be encouraged to emerge from the plantation stage of development into the manufacturing arena. The growing manufacturing interests at home sought to perpetuate the colonial monopoly, and economists like Sir Josiah Child, realising the growth of industry in such a colony as Connecticut, reported that "if allowed it will soon appear to be a mighty prejudice to the consumption of the manufactures of England which I hope England will never allow of."

This opinion was expressed in numerous official and other reports of the period and was, of course, the logical outcome of the economic policy of the seventeenth and eighteenth centuries, when the commercial interests of England and her American colonies in many respects were hopelessly at issue. Under the Navigation Act of 1660, certain enumerated articles such as sugar, tobacco, cotton wool, indigo, and ginger, could not be shipped to any country except England or some other English plantation, and by subsequent acts these restrictions were further extended by the inclusion of other commodities until the natural flow of commerce was hampered in many directions for the sole benefit of the mother country. Thus an act forbade the carrying not only to England, but also to any other plantation of wool or woollen manufactures being the produce or manufacture of any of the English plantations in America—a direct attempt to stifle the growth of an infant industry in any British territory beyond the confines of England. On the other hand, bounties and preferences were granted on certain products,

such as colonial grown sugar, but it was not until the year 1825 that the commerce of the colonies was opened to all friendly nations, and the final repeal of the Navigation Acts did not occur until 1849.¹ Nevertheless it is true that the real end of the old mercantile system came when the Bostonians threw their chests of tea into the sea and, in striking a blow for freedom from taxation imposed by the Imperial authorities put an end to the one-sided economic system that Great Britain had attempted to force on her colonies. The economic revolution in the nineteenth century which ushered in the period of laissez-faire was in reality a revulsion from a grandfatherly system of trade-monopoly which was quite unsuited to the spirit of the new and vigorous communities which were establishing themselves in Canada and Australasia.

Whatever else the laissez-faire policy, which succeeded the purely plantation era, may have done, it at least enabled the colonies of the new empire to commence and consolidate their own infant industries and to emerge successfully from the purely productive state in which it had pleased Great Britain to leave them.

The first serious blows at the manufacturing supremacy of Great Britain came from those continental nations, particularly Germany, who, by subsidising steamships, using their State railways as effective economic tools, by increasing their tariffs, and by many direct and indirect methods of State intervention and encouragement, were building up and protecting their own industries and gradually penetrating into markets which hitherto had been regarded as peculiarly British monopolies. In the last quarter of the nineteenth century profound changes were occurring in the economic position of Great Britain—changes that ushered in the new era of constructive imperialism which was to produce so remarkable a cleavage in the time-honoured attitude of the government towards trade, to alter completely the conception of a

¹The official attitude of the mother country at this period is well explained in an answer by the Secretary of State to a Memorial from the Jamaica House of Assembly. "You will impress upon the memorialists that it is to their own exertions rather than to legislative measures that they should seek for aid." At this time the Navigation Laws were still in force, and all measures of protection in the British markets were being withdrawn from the Colony, "a protection which the island had enjoyed from the time it first became a British colony."

non-intervening State, and to modify our ideas of the value of the undeveloped portions of the Empire.

This period was ushered in by the undignified scramble for territory in Africa which began in the early eighties, and did not end until the whole of Africa had been carved into those protectorates and spheres of influence which graced the political banquet of the closing years of the nineteenth century. Great Britain, France, Germany, Italy, and Portugal—the last determined not to let the remains of its great colonial empire fall into the hands of more virile competitors—secured vast possessions in Africa, while Leopold, King of the Belgians, by a boldly conceived policy, obtained as his personal domain the greater part of the enormous territory covered by the basin of the Congo. The immediate cause of the partition of Africa was the desire of Germany to emerge from the Baltic upon the highways of commerce as a great colonial power; but Germany only put the torch to the smouldering fires of desire, and in reality the movement was almost overdue, for men were beginning to realise, somewhat dimly and uncertainly, that the tropics were the great latent store-houses of the world's economic energy. Although combined with the actual political work of obtaining empire in Africa was the altruistic motive of putting an end to slavery and securing the natives the benefit of Christianity and civilisation, ideas which undoubtedly played a great part in eliciting the support of large sections of the community both in Great Britain and on the Continent, the impelling motive, scarcely realised but nevertheless predominant, was the necessity for obtaining control of the raw products of commerce. The glamour of Africa due to the exploring activity of Livingstone, Stanley, and the German and French explorers, certainly played its part in directing attention to its newly discovered countries; but the main purpose at the back of men's thoughts was economic, and connoted a realisation of the industrial needs of the commercial nations.

We are now sufficiently distant from this period of feverish activity to see these events in their true perspective and to realise that the last twenty years of the nineteenth century will rank as one of the most important epochs of expansion in the annals of mankind. The race

for territory in Africa was followed by a new scramble for land in Asia; but conditions were different, for the rise of Japan as a great power capable perhaps of dominating the Pacific, and the age-long inertia of China, which, although ever seemingly about to fall asunder like a pack of cards, nevertheless offered a stolid and apparently indifferent front to the intruders, presented a new problem for European nations. Apart from the British advance in Burma and the Malay States, the acquisition of territory by France in Indo-China, and the expulsion of Spain from the Far East and the substitution of American influence, comparatively little territory was acquired on the Asiatic continent, although India was continuously extending northwards and westwards as the Russian octopus stretched its tentacles farther and farther south and east.

What distinctly emerged from the political events of this third epoch of colonial expansion was that Great Britain was no longer an unchallenged world-power. Her markets were seriously threatened, and the day of small and self-contained economic units was swiftly passing. Three great land-empires had already risen to dispute its economic supremacy. The rise and extension of rail-power had introduced formidable competitors into the economic sphere and had created three new empires with vast, and in two cases only partly developed, resources—Germany, Russia, and the United States—while in the Far East sea-power had resulted in the creation of another empire which in many respects was the counterpart of Great Britain in the west and was already proving a political and economic factor that could not be disregarded. As friend or foe Japan was a formidable intruder, and fortunately British policy realised in which direction our interests were chiefly engaged.

Such being the position at the close of the nineteenth century, it became necessary to reorganise the British Empire, to introduce new means of defence, political, military, and economic. In the present volume we are only dealing with the last, and that only so far as the actual production of raw materials in the overseas empire is concerned. It will therefore be necessary to concentrate our attention more particularly upon the purely economic aspects of this important epoch in the progress of world-

development which was succeeding, and had arisen out of, the age of steam, and was due to the enormous advances made in the realms of scientific discovery as applied to the problems of production and manufacture. As has so often happened in the annals of the British Empire, the crisis produced the man. The somewhat nebulous, unproductive, and certainly laissez-faire, policy of the second half of the century, when politicians were content to regard the mother country as the supreme object of their statesmanship, was succeeded by a period in which statesmen were adopting a wider view of their responsibilities and had begun to realise that Great Britain, though the centre and most important part of the Empire, was depending for her existence to a greater and greater degree upon the outer portions of the imperial system.

The position of Colonial Secretary, from being an office of almost secondary rank in the hands of such men as Granville and Kimberley, became one of supreme importance owing to the dominating personality and energising vitality of Joseph Chamberlain, who, in the year 1895, deliberately chose that position owing to his prevision that in reality the reorganisation of our colonial empire formed the most important work that could be undertaken by a man of energy and initiative. For eight years Chamberlain laid down the lines of a new constructive policy with conspicuous success, and when, worn out by his ceaseless activity in the cause he had at heart, he laid down the burdens of office, he had stamped his name on the pages of British history as one of the great outstanding figures in our imperial development.

What Chamberlain chiefly realised, and the idea upon which his policy was principally framed, was that the Imperial Commonwealth formed two distinct empires which could only be welded into one harmonious whole by pursuing a policy of economic development, so directed as to secure the greatest interchange of products and manufactures between the different parts of the empire. In this respect the British Empire was strikingly different from the three competitors that had arisen on the political horizon. There was no homogeneity such as is to be found, for example, in the United States, but regions of extreme diversity, racial, climatic, political, religious; and countries of great disparity in social and economic

progress. Generally speaking these diversities continue at the present day, although the results of Chamberlain's policy have in some respects brought about a diminution in the points of dissimilarity by developing new areas suitable for white settlement in territories formerly considered purely as tropical preserves.

Broadly considered the British Empire may be regarded as falling into two distinct categories: regions where white men can settle and tropical and semi-tropical areas where permanent settlement by Europeans is, generally, impossible. The first division includes countries mainly of temperate climate, furnishing wheat and other temperate food products for the mother country. These countries are sparsely populated and, with the exception of South Africa, almost exclusively settled by Europeans. They form the great self-governing Dominions of the British Empire. The second division includes the tropical and semi-tropical countries of Asia and Africa, frequently densely populated, and, with the exception of the great Empire of India, containing native races under the direct control of the small minority of Europeans who dominate their economic and political life. From this category come the great supplies of raw materials and food products forming the lure which beckoned Europe to Africa and the East: tea, coffee, sugar, cocoa, rubber, fibres of every kind, oils and nuts, spices. Many of these products have practically taken their place as important items in our economic life within comparatively recent years, such for instance as rubber; some have been put to new and important uses since Chamberlain first introduced his policy of development, such as the oil-palm now used for the production of margarine; and some have only been cultivated to a considerable extent in the British Empire during the last few years, such for example as cocoa, which forms so great an asset to the Gold Coast Colony.

Yet though these territories of the British Empire differ so widely from each other, each is complementary to the others. The great tropical empire is complementary to the empire of the five self-governing Dominions and the main connecting link from which capital and manufactures have flowed in the past and still continue to flow, and towards which products come over the Seven Seas, is the United Kingdom. Speaking of "the Two Empires"

which constitute the imperial domain, Lord Milner in 1908¹ after stating that he wished that "we could have two generally recognised appellations by which to distinguish the two widely different and indeed contrasted types of State of which the Empire is composed," said that "on certain points—it is true these are only, so to speak, the fringes of our tropical and sub-tropical possessions—the two Empires are already in contact. I need only point to the growing interest of Canada in the West Indies, or the still greater interest of Australia and New Zealand in the British dependencies in the Pacific." This tendency for the great Dominions to assume responsibility for neighbouring and outlying portions of the British Empire has been further emphasised since the war, and it is a tendency based quite as much upon economics as political reasons. The time does not seem to be far distant when within the empire there will be a series of self-governing communities, each with its administrative and economic dependencies looking to a local centre for political and economic guidance rather than to the mother country. Already in the Pacific Australia has added to her sphere the German portion of New Guinea, while New Zealand undertakes the administration of a number of outlying dependencies, including German Samoa, the Cook and Harvey Islands, and other islands, and on the Atlantic Coast South Africa is administering the late German colonies in South-West Africa, and still desires to increase her borders by the inclusion of Rhodesia and the purely native territories. Canada, too, favours the closest reciprocal trade relations with the West Indies, which form so desirable a tropical complement to the northern Dominion. It is evident, therefore, that there has been a great development in political thought since Chamberlain laid down the broad lines of his policy in his speech on the Estimates on August 22, 1895.

That speech was in many respects an epoch-making pronouncement. "I regard many of our colonies," he said, "as being in the condition of undeveloped estates and estates which never can be developed without Imperial assistance. . . . Cases have already come to my knowledge of colonies which have been British colonies perhaps for more than a hundred years in which

¹ Royal Colonial Institute, June 16, 1908.

up to the present time British rule has done absolutely nothing, and if we left them to-day, we should leave them in the same condition as that in which we found them. . . . I shall be prepared to consider very carefully myself and then, if I am satisfied, to confidently submit to the House any case which may occur in which by the judicious investment of British money those estates which belong to the British Crown may be developed for the benefit of their own population and for the benefit of *the greater population which is outside.*" Doubtless Chamberlain in speaking of colonies where British rule has done absolutely nothing had in mind such territories as British Honduras, certainly the Cinderella of the Caribbean; British Guiana (whose exports in 1836 were more than those in the year 1895); some of the West Indian Islands which flourished exceedingly during the period that their sugar was protected in the British markets; the Gambia Colony, which has only achieved economic importance since the ground-nut was discovered to be an important article of commerce; Sierra Leone, which in 1895 was still the white man's grave; and possibly the tropical Northern Territory of Australia, which economically was in about the same condition as it was in the sixties.¹

In the broader aspects of his statement, however, his speech marks an extremely important divergence from the almost traditional policy of non-interference in economic matters. It showed that the most practical man in the

¹It is interesting to notice in support of Chamberlain's contention, the following statistics of these colonies:—

British Honduras.	Exports in 1836	....	....	£493,000
"	" " 1887	....	....	£208,000
British Guiana.	" " 1836	..	....	£2,167,000
"	" " 1887	....	....	£2,190,000
Gambia.	" " 1837	....	....	£138,000
"	" " 1887	....	....	£118,000
Sierra Leone.	" " 1837	....	....	£108,000
"	" " 1887	....	....	£333,000
Jamaica.	Exports of Sugar in 1805,		150,352	hogsheds
"	" " " 1837,		61,505	"
"	" " " 1911,		20,060	"
"	" " Rum " 1805,		53,950	puncheons
"	" " " " 1837,		21,976	"
"	" " " " 1911,		11,454	"
"	" " Coffee " 1805,		215,512	cwts.
"	" " " " 1837,		79,957	"
"	" " " " 1911,		60,051	"

new administration realised that the functions of government were economic as well as political, and it marked a new conception of the idea of trusteeship—the recognition of the doctrine that administration should be directed for the benefit both of the native inhabitants, and the larger world of which they only formed a part. The development of the resources of the Crown Colonies was plainly recognised as part of the duty of Great Britain, and although it was contrary to all tradition that the government should sink money in the development of its overseas possessions, a period of great activity was initiated and the government bound itself to undertake certain direct and indirect works of development which have had a profound effect upon the economic evolution of the British Empire.

Chamberlain's policy indicated a remarkable change in the national outlook since the days of *laissez-faire* when it was generally believed that the colonies would drop like over-ripe fruit from the parent tree, and when the extension of responsibilities in any direction was thought to be contrary to the best interests of the United Kingdom. It included six distinct methods of strengthening the economic position of the United Kingdom and developing the resources of the overseas empire, each of which has contributed in a marked degree to the prosperity and economic stability of the British commonwealth of nations. These methods were both direct and indirect, and each formed an essential part of the mosaic of constructive imperialism which was commenced when Chamberlain undertook the rebuilding of the tottering economic fabric of the British Empire. The six main features of the new policy were the following:—

- (1) The building of railways and other permanent works, such as harbours, through the direct financial aid of the Imperial government.
- (2) The encouragement and financing of institutions for the study of health in the tropics.
- (3) The encouragement of the study of scientific agriculture in order that the best results might be achieved in those countries where agriculture was as yet little understood, and in order that the natives might be trained in the best methods of production.

- (4) The stopping of the bounty system by which foreign governments had built up a great sugar industry, and might equally develop other productive industries, at the expense of the sugar-producing and other colonies of the British Empire.
- (5) The subsidising of steamships so as to enable the fruit of the West Indies to reach the British markets, and other indirect methods of preference to colonial products.
- (6) The revision of the tariff system, so that tariffs could be scientifically arranged for the benefit of producers and manufacturers and ultimately for the benefit of the consumer.

It is not possible here to study each of these methods in detail. The first will be described in a separate chapter, but it may be said that although railway development in the Crown Colonies was not primarily the outcome of Chamberlain's policy, as the Uganda Railway had been under discussion since the preliminary survey in 1891, it was his energising vitality that brought about the constructing of railways in West Africa and led to the development of the hitherto greatly neglected West African colonies. Although Chamberlain's policy undoubtedly had its roots in railways and the extension of communications, whereby the raw products of the Empire could be brought to the markets of the United Kingdom, it is by other methods of development that his genius will be chiefly judged.

The second means of development, now recognised as essential in all tropical countries, are fully described in another volume of this series, and the most brilliant and fruitful results have flowed from the policy of encouraging the study of tropical hygiene and medicine. West Africa, and particularly Sierra Leone and Lagos, and other tropical possessions had long been regarded as countries where to live was to die, and it was believed, with justice owing to the prevailing methods of sanitation and manner of living, that white men could not retain their health for any prolonged period in these portions of the tropics. Enormous areas were infested with the tsetse fly, which rendered any kind of animal transport impossible, and men alone were available for portorage.

The result was that the productive capacity of these territories was extremely small, although it was well known that the fertility of the soil was very great. Products could only be brought to the coast at costs which stifled all enterprise. Moreover, the Europeans who were required to superintend production were subject to malaria from which neither they nor the natives were immune. In Central Africa the dreadful scourge of sleeping sickness was sweeping away great numbers of natives in its devastating progress, and in every part of Africa and the tropics dreadful diseases, some of which had been introduced by the white man, were prevalent. It was recognised that only by studying these diseases and striking at their roots, and by training qualified medical men and scientific investigators, could the incubus which rested upon the fertile but evil soil be vanquished. Accordingly, in 1898, Chamberlain urged the importance of the study of tropical medicine and schools were opened in London and in Liverpool,¹ and permanent research laboratories were established in Ceylon, Nigeria, the Federated Malay States, at Khartoum, and elsewhere, some supported by private funds, others assisted by the government. The investigations made by medical men, the rapid advance of medical knowledge, and the remarkable discoveries made in the treatment of disease, and in the application of preventive hygiene have almost completely changed the conditions that prevailed in the tropics in the closing years of the nineteenth century. The direct result of these measures has been of incalculable benefit to mankind generally, and has enabled the productive capacity of tropical countries to be greatly increased.

In the study of tropical agriculture such remarkable results have been achieved that a book might be written on this topic without exhausting the advances that have been made as the outcome of Imperial intervention in the domain of practical agriculture. The brilliant success of science as applied to agriculture has led to an enormous and direct increase in the productive capacity of the British Empire. The Imperial Department of

¹To these bodies must be added the Tropical Diseases Bureau and the Tropical Diseases Research Fund, and the Entomological Research Committee.

Agriculture, established in the West Indies, was the first fruits of Chamberlain's policy in this direction. The head office was placed at Barbados under the direction of Sir Daniel Morris, who had been transferred from Kew to act as Technical Adviser. The Imperial Commissioner is in administrative control of the botanic and experiment stations maintained for the distribution of economic plants, and the improvement of sugar, cacao, lime, cotton, fruit, and other crops, and for studying preventive means to be applied to plant diseases. These stations have been established at Grenada, Saint Vincent, Saint Lucia, Dominica, Montserrat, Antigua, Saint Kitts-Nevis, and the Virgin Islands, and one of the direct results of the work there carried on has been the improvement of the yield from the sugar cane from ten to twenty-five per cent., the establishment of a high-class sea-island cotton, the discovery of parasites which were injuring plants, and the organisation and stimulation of practical agricultural education in all the West Indian colonies. The teaching of agriculture is now part of the daily routine of boys in many of the West Indian islands and in Trinidad, the West Indian Agricultural College, a large proportion of whose funds has been provided by the West Indies aided by a grant from the Imperial treasury, is doing a most valuable economic work in connection with agriculture. The work of the Imperial Department of Agriculture has now been amalgamated with that of the West Indian College, the headquarters being in Trinidad.

The impulse given to scientific agriculture in the West Indies was passed on to other parts of the British Empire, and is, of course, additional to the excellent work carried on by the agricultural departments in the Dominions and India. The work of the Indian Department of Agriculture, particularly of the Agricultural Research Institute at Pusa, has been of enormous benefit to mankind, and the series of publications issued by that department take the highest rank for the practical scientific and economic material they contain. Men trained in these departments have been appointed to other colonies and similar departments have been set up in the Federated Malay States, the Kenya Colony, Gold Coast, Nigeria, and Egypt. In the East country experimental work has been largely concerned

with the cotton crop and the story of the production and distribution of the best seed and of the crusade against the cotton worm forms one of the most romantic chapters in the history of tropical agriculture. In Ceylon the Agricultural Department, and in particular the Botanic Gardens at Peradeniya, have done a really notable work, and there is scarcely any part of the British Empire, ranging from Fiji to Nyasaland, and from Nigeria to Singapore, in which the special needs of the local community are not being studied. In addition, the work of the Imperial Institute in London, which has acted as a kind of clearing-house for the investigation of new products, has been of such great service to India, the Crown Colonies, and the Dominions generally, both from the economic and scientific points of view, that it is to be regretted that greater recognition of its services has not occurred in quarters well able to appreciate the value of its work. The Research Laboratories of the Scientific and Technical Department have been of such great value that every effort should be made to carry on and extend this highly practical form of scientific investigation.

The question of agriculture, so intimately concerned with production, can perhaps be best studied in the West African colonies, where it is connected with problems of labour and the development of an indigenous type of civilisation the prosperity of which depends primarily upon efficient methods of cultivation. In tropical countries where there are large native communities vastly outnumbering the European planters, traders, or officials, as is the case in the densely peopled territories of West Africa, such as Nigeria with seventeen million natives to some three thousand Europeans, it is naturally a matter of supreme importance that native labour should be so trained as to get the best possible results from the soil, so that the productive capacity of the country and the general prosperity of the community may be increased. This can be done in two ways ; either by means of large plantations under European ownership, and European management, individually or by large mercantile corporations ; or by small estates owned and cultivated by natives working under the advice of specially trained agricultural officials ; or by a combination of both methods. The first method is more particularly in

evidence in colonies like Kenya, Tanganyika, Rhodesia and Nyasaland, where the native population is neither large nor highly developed, and the second in colonies like the Gold Coast, Nigeria, and Uganda, where the natives are economically and politically more advanced. In West Africa more particularly, the question of production is intimately connected with the native systems of land tenure and the tendency during recent years has been to encourage by every possible means the development of an indigenous culture, having its roots in the land and retaining all that is best in the native systems of administration. "I am strongly opposed to any encouragement being given by the Administration for which I am responsible," stated Sir Hugh Clifford, the Governor of Nigeria, "to projects that have for their object the creation of European-owned and managed plantations to replace, or even to supplement, agricultural industries, which are already in existence, or which are capable of being developed by the peasantry of Nigeria." In these words are expressed definitely and decisively what has now become the keynote of British native policy in West Africa—the encouragement and establishment of a native peasantry wherever that is possible, the development of native industries, and the foundation of a system of agricultural and industrial education upon broad and comprehensive lines.

It is unnecessary here to emphasise the enormous success from the productive point of view of individual enterprise in the Gold Coast, in Nigeria, and in Uganda, where there is now sufficient evidence to prove conclusively that the native, if properly encouraged and directed, is capable of great activity and of supplying essential products to the European markets. In the Gold Coast the cocoa industry has been built up entirely by the natives. The plantations are worked and owned by natives who by their own initiative have established a great industry, which now supplies a considerable proportion of the cocoa used in commerce. Similarly, in Uganda, the cotton industry is the result of native enterprise aided by European encouragement.

So far as the State itself (that is, the State in the Crown Colonies), is concerned, its main function with regard to agricultural production is the extension by every possible

means of a knowledge of the best methods of agriculture and for this purpose agricultural teachers and experts are being trained in the West African and other colonies, whose chief business is to go among the natives, to win their confidence, and to instruct them how to sow, grow, and garner their crops. With respect to production, more especially in Africa, it is desirable to examine briefly certain proposals put forward by the Empire Resources Development Committee because they represent the views of men who, although at one with those who recognise the need for increased production, are at the other extreme of political thought with respect to the best methods to be adopted. These proposals have been severely criticised in certain quarters, notably by Sir Frederick Lugard, whose knowledge of the mentality of the African races is as sound as his knowledge of their economic capacities.

The proposals put forward by the Empire Resources Development Committee, mainly the work of the late Mr. Wilson Fox, were (1) to secure the conservation for the benefit of the empire of such natural resources as are, or may come, under the ownership or control of the Imperial, Dominion, or Indian governments; (2) to develop certain selected resources, such as vegetable oil products, under such conditions as will give to the State an adequate share of the proceeds; and (3) to secure the appointment of a Board for the conservation and development of the resources of the empire, so that imperial effort may be concentrated on assets ripe for development for the common good of the empire. The proposals of the Committee were extremely attractive, more particularly as they connoted a co-ordination of productive effort—a most desirable object that perhaps could best be secured by some central body such as that suggested by Mr. Wilson Fox. What has been achieved in Canada by the Commission of Conservation might well be applied to the empire generally, or at any rate to the tropical colonies, and extended by the work of developing as well as conserving the natural resources of the tropics. Moreover, the proposals that were put forward were made doubly attractive by the suggestion that the vast and over-burdening taxation that fell upon the people of the United Kingdom might be reduced by developing the productive capacity of the empire. “It seems to

me that it is impossible to contemplate the burden of debt," stated Lord Milner on October 31, 1916, "which will rest upon the whole Empire and to imagine that we shall be able to carry, or at any rate to reduce, by existing methods of taxation, that fearful burden." Surely our eyes should turn more closely upon the vast and varied resources of our Empire and their future potentialities. There are questions of the gravest import touching their control, development, and utilisation for a common purpose; the production of an adequate food supply; means of transportation and communication; the utilisation of raw materials by the most effective methods for all needful purposes of national concern."

The main feature of the proposals put forward was the development by the State for the State of some of the at present undeveloped resources of our vast empire. It will be seen at once that here was a great advance upon all proposals put forward by Mr. Chamberlain in 1895 and an extension of the active and benevolent encouragement by the State of productive enterprise into an actual participation in the work of development if not an ownership by the State itself of the means of production in tropical countries. It was sought to establish great monopolies in certain essential commodities which would be organised, worked, and controlled by the State. It is not the place here to criticise or support these proposals. They mark an advance upon the constructive imperialism of the early years of the century which is closely allied to imperial socialism, seeing that it was possible for Mr. Wilson Fox to "visualise the State as an owner of vast herds of cattle overseas, raised on lands which are to-day unutilised; and as a proprietor of forests and valuable plantations of tropical shrubs and trees grown in areas which are still virgin," while "one of the methods by which the State can derive profits from its tropical estates is to keep in its own hands the power of producing, trading in, and exporting certain special products, and especially products in which either a complete or partial monopoly can be established, such as jute or palm kernels." From the practical point of view these proposals mark an interesting phase of the movement for greater production but they are unlikely of achievement so long as the system of an indigenous agricultural industry, encouraged

but not owned or even controlled by the State, is followed in Africa and elsewhere. So long as the policy laid down by Sir Frederick Lugard that "the Power in control in dealing with subject races should in no remote way seek advantage at their expense, and any sacrifices asked from them in return for however great sacrifices by the Suzerain Power must be wholly voluntary" is followed, the development by the State (that is by the Imperial Government), or by its nominees or partners, by means of monopolies, of the products of the tropical colonies is practically impossible. Moreover, the basis of all successful administration in the tropics is the security of the land-tenure of the natives which would hardly be achieved under the system suggested by the Empire Resources Development Committee.

Far more practical were the proposals of the Dominions Royal Commission which was first appointed in 1912, and presented its final report in 1917. Unfortunately the investigations of this commission were confined to the Dominions, and they were not concerned with what to some economic thinkers will be the most valuable portions of the empire from the productive point of view. It came into existence in consequence of a resolution of the Imperial Conference of 1911, and was appointed to inquire into the natural resources of the five self-governing Dominions, and the best means of developing these resources ; the trade of these parts of the empire with the United Kingdom, each other, and the rest of the world ; and their requirements, and those of the United Kingdom in the matter of food and raw materials, together with the available sources of supply. It was also empowered to make recommendations and suggest methods, consistent with existing fiscal policy, by which the trade of each of the self-governing Dominions with the others, and with the United Kingdom could be improved and extended.

At the outset there were not wanting those who believed that the work of such a commission would be more or less superfluous in view of the many admirable reports that had already been issued in the Dominions, dealing with their products and resources, such for example as the geological, mining, and agricultural reports issued in Canada, South Africa, and Australia. Such

material was, however, of very unequal value and there was a want of co-ordination in this respect between the different Dominions and frequently between the different States or Provinces of the same Dominion. It very soon became apparent as the commission proceeded with its work that by co-ordinating the available information and collecting fresh material it was performing a most valuable service.

But its work went much further than the collection of information regarding the products of the Dominions. The terms of reference were sufficiently elastic to include most questions connected with the development of production and trade, and full advantage was taken of the opportunity of presenting what may be considered as a valuable economic survey of the self-governing communities and of reporting upon the best means of furthering the economic independence and inter-dependence of the British Empire. It is only to be regretted that the investigations of this, or some similar commission have not been extended to the tropical colonies so that a complete economic survey of the British Empire may be available for reference in a concise and easily accessible form. That such was the opinion of the commission is evident from its statement of the two strong and impelling impressions received as a result of its investigations. The first was that "for Empire purposes no survey can be complete without including India, the Crown Colonies, and the Protectorates. In themselves, and even as now developed, they form too vital and important a part of the Empire to be left out of present calculations. But it is plainly evident that their potentialities, measured by any fair standard, are immense, and that their future contribution to the Empire's strength and greatness will far surpass those of the past." The second impression was concerned with "the almost infinite variety of the Empire domain, the extent of its area, the inequality of distribution of its population, and the disconnected character of its governing and directing machinery."

The results of the inquiries of the commission were, in fact, that its members were struck with the lack of co-ordination of effort and the inadequacy of existing organisations to deal with many vital matters connected with the economic prosperity of the empire, such as

cables, mail services, development of harbours and waterways, migration, legislation, statistics, and many other questions connected with the mechanism of commerce. The commission emphasised, therefore, the need for a new Imperial Development Board to deal with such matters. There cannot be the slightest doubt that such a body would exercise a very powerful influence even though it had no actual administrative duties delegated to it. Since the date of the commission's report the urgency of promoting Imperial development on scientific lines is more generally realised and if the functions of the proposed Board were also to include the encouragement and development of actual production, it would form a most useful body, bringing many diverse authorities in various parts of the empire into the closest touch and co-operation.

In this respect the actual work achieved by the Commission although purely tentative was extremely valuable. The Commission reported that "a preliminary survey is needed of the relations between Empire production and Empire requirements throughout the whole range of articles needed for the sustenance or well-being of the people, for the maintenance of industry, and for the production of munitions for war. So far as we know, such a survey has never been undertaken." It is then suggested that the survey should divide the necessary materials of trade and commerce into three main categories: (a) Materials of which the world's requirements are mainly or wholly produced within the empire; (b) Materials of which the empire's requirements are approximately equalled by empire production; (c) Materials of which the world's requirements, and with them those of the empire, are now mainly produced and controlled outside the empire. It is not necessary here to consider in detail which products fall within these different categories, although it may be stated that jute, asbestos, and nickel fall within the first division; that wheat, butter, cheese, and wool come within the second category; and that cotton, petroleum, nitrates, and potash fall within the last division. There can be, therefore, no doubt that from the point of view of production alone, with which we are chiefly concerned, the functions of an Imperial Development Board would form an

invaluable extension, and be the natural outcome, of the policy initiated by Chamberlain and continued by the succeeding government.

The fourth feature of the new constructive imperialism which we have been considering was the stopping of the bounty system by which foreign governments built up a great sugar industry at the expense of the West Indies and other British territories. These colonies depended upon sugar for their prosperity and their industry was practically ruined by the bounties that were given by foreign governments to the growers of beet sugar, so that it appeared as though the control of the market in sugar would quickly pass into the hands of foreign nations. The subject of bounties and countervailing duties on bounty-fed articles is too intricate to be dealt with here, but it may be stated that the attitude of the British government on this question has always been an uncertain factor so far as sugar production was concerned. It was not until the Indian government, in 1887, imposed countervailing duties on Russian sugar that the Foreign Office definitely opposed the Russian protest, although for some time it had been in general agreement with the policy. Finally the United Kingdom became a party to the Brussels Convention of 1902, and agreed to prohibit the importation of sugar from bounty-giving countries. By this action Great Britain stopped the bounty system, since it was hardly worth while for bounty-giving countries to have one of their greatest markets closed against their sugar. This action of the British government retrieved the situation so far as the West Indies were concerned, as planters were no longer afraid that the improvements they effected on their estates would be rendered useless by further increases in the foreign bounties. The West Indies also were enabled to extend their markets owing to the fact that during the years 1903-1910, the German-Canadian tariff war had the effect of shutting out German beet sugar from the Canadian markets, while the position of the sugar growers has been further strengthened by the granting of preferential rates on sugar from within the British Empire under the Finance Act of 1919.

The fifth method by which Chamberlain came to the rescue of certain languishing industries in the British

colonies was by subsidising steamships in order to enable certain products to reach the British markets. This subject in reality belongs to the realm of communications, but it has, nevertheless, an important bearing on production. The most important example of this process of building up a new industry was the subsidy of £40,000 a year, granted to a line of steamers so that the fruit of Jamaica and other islands in the West Indies could be brought at a cheap rate to the British markets. Although this grant was given partly in order to encourage an alternative industry to the growing of sugar, which was then in a precarious condition, it had a most important result in bringing about a great increase in the banana trade. Though we have no immediate concern with the question of steamship subsidies generally, it should be stated here, that in the case of mail subsidies certain contracts (*i.e.* that of the Commonwealth of Australia with the Orient Company in 1907), contain special stipulations with regard to the rates of carriage of certain goods. In the case of the Union of South Africa, important servitudes (such as the free carriage of pedigree stock to the Union), were imposed and definite engagements favourable to trade development were undertaken; while contracts by the Canadian government for subsidised services to Great Britain, Australia, New Zealand, and South Africa contain clauses definitely favourable to inter-imperial trade.

In the same way although the question of tariffs is beyond the scope of this book it is nevertheless necessary to allude briefly to the system of Imperial preferences which formed a feature of the new constructive imperialism because they have a direct bearing upon the question of production. The return to a system of preferences was a grave move calculated to embroil the United Kingdom with other countries which had long benefited from the Most Favoured Nation Clause in commercial treaties. The British preferential system is a difficult question to deal with owing to the divergent attitude adopted by the Imperial authorities and those who were responsible for the tariff policies of the Dominions. The strong feeling expressed by the Dominions in favour of granting to the United Kingdom and other portions of the empire, preferences on goods that did not actively compete with

their own infant industries met with small response from the mother country. This was partly owing to the fact that the majority of voters was still wedded to the well-tryed system of Free Trade, and partly due to the fear that as preferences would generally have to be granted upon foodstuffs and raw materials, the cost of living might be unduly increased in the United Kingdom. The development of differential tariffs in the centre of the Empire had, therefore, to await a definite change of opinion on the part of those who elected the British Parliament. This change of attitude has been slow in coming and even now a satisfactory system of preferences cannot be said to have been adopted as a national policy, seeing that a very considerable number of voters is still opposed to the principle expressed in preferential tariffs.

It is not necessary to trace the slow processes by which the Dominions finally became responsible for their own fiscal policies, that is, entirely free from any interference by the Imperial authorities in their tariff arrangements. So late as 1859, the British government attempted to interfere with regard to a protective tariff imposed by the Canadian Parliament and limitations upon the rights of self-governing colonies to give intercolonial preferences to each other were not finally removed until an Imperial Act was passed in 1895. Two years later, the Treaties which prevented the United Kingdom from giving or receiving preferences from the Dominions were denounced in response to a demand made at the Ottawa Conference of 1894, and the position of the United Kingdom *vis-a-vis* with foreign countries for a time became precarious.

From this period the self-governing colonies began to give preferences to the mother country. The first to take this important step was Canada, which in 1897 extended preferential treatment to the United Kingdom, British India, New South Wales, and certain foreign countries. This move led to the German-Canadian Tariff War mentioned above. Subsequently these benefits were accorded to numerous British colonies and a special preferential treaty was entered into between Canada and the majority of the West Indian islands (1912 and 1920), whereby the economic relations between the Dominion and its nearest tropical neighbours were strengthened and West Indian production greatly stimulated. Similarly

preference was granted to the United Kingdom by New Zealand and South Africa in 1903, and by Australia in 1908.

So far as inter-imperial preferences are concerned, Canada started the movement, as mentioned above, in 1897. The Commonwealth of Australia extended the system to South Africa in 1906, and New Zealand preference with South Africa first became effective in the same year, when a treaty was signed, although a reciprocity act, rendering this possible, had been passed in 1903, which extended the system to all parts of the empire.

The main results of preferential reciprocity have been to stimulate trade between the different parts of the empire, in precisely those products which are complementary to each other. But it has had, perhaps, a more important effect in demonstrating the economic solidarity of the British Empire, and showing how the common connection with the mother country is leading more and more to a community of trade interests between the different parts of the empire. From this point of view inter-imperial preferences have become a strong factor in binding together the divergent countries forming the imperial domain. So far as the United Kingdom is concerned the proposal to give tariff preferences was decisively defeated at the polls in 1906 after a prolonged fight over the Chamberlain preferential policy between Free Traders and Tariff Reformers. But it has been well pointed out that in spite of this initial defeat considerable preferences did in fact exist on the part of the United Kingdom, particularly with regard to Colonial Trustee Stock.¹ For the time being, however, the subject of tariff preferences had perforce to await the education of public opinion in Great Britain. It was not until the pressure of war brought about a reconsideration of the whole question that the first effective steps were taken to introduce an imperial preferential tariff. This event had been preceded by the preferences mentioned above and by certain rebates on export duty which were in reality another form of preference granted by the colonies to

¹ It was pointed out by Sir Edgar Speyer (*Times*, May 28, 1911) that the fact that Great Britain supplied money at a cheaper rate than it would have been lent outside the empire meant a saving of at least £10,000,000 per annum to the Dominions and India.

the mother country. Thus, in 1903, the Straits Settlements arranged for a rebate of export duty on tin if it were to be smelted in the United Kingdom, and in 1916 Nigeria granted a similar preference on tin exported to other parts of the empire, while the four West African colonies imposed a duty on palm oil and kernels, which in 1919, was made differential by levying the duty on these products exported to places outside the British Empire. A similar attitude was adopted by India, which grants a rebate on the duties on hides exported to countries within the empire. The differential excise duties imposed in West Africa met with much criticism, mainly on the ground that they might prove a restriction on the trade of the natives,¹ but the position so far as India is concerned is decidedly different owing to the fact that India is in a position whereby she can make her own tariff arrangements without any interference by the Imperial authorities; since the pressure that can be exerted by the Home Government is now economic rather than political. For this reason the Indian Government has been able to increase its import duty on cotton piece goods as a measure of protection for her own industries without increasing the excise duty on cotton grown in India, in spite of the vigorous protests, no longer politically effective, of the Lancashire cotton industry.

The granting of preferences by the British Government was the direct outcome of the resolutions of the Imperial War Conference of 1917. That meeting marked a great advance in imperial sentiment since the period when, by his speech about banging and bolting the door,² Mr. Winston Churchill had voiced the British official attitude in a highly provocative manner, and had caused the Dominions to pursue their own policy without any

¹ The differential excise duties were withdrawn in 1922, after numerous heated debates at Westminster, the Colonial Office claiming, as a parting shot, that they had "extremely valuable results . . . the margarine-making industry has now been firmly established in this country; and whereas before the war the free market for kernels was at Hamburg, and there was no free market at Liverpool, now the position is reversed as the result of this policy, and the port of Liverpool has now become the free market."

² Mr. Churchill, at Edinburgh, on May 18, 1907, stated that the Government had "banged, barred, and bolted" the door on Imperial Reciprocity, and "would not concede one inch, they would not give one farthing preference on a single peppercorn."

further suggestions for reciprocity on the part of the Imperial Government. It was not until 1919, that these resolutions became effective, when under the Finance Act of that year certain preferences, designed to stimulate directly production in the British overseas domains, were granted. Preferential rates by which empire-grown tea, cocoa, coffee, chicory, currants, dried fruits, sugar, glucose, molasses, saccharine, motor spirit and tobacco were admitted at a duty one-sixth less than the full rate, and wine and spirits at various percentages less than the full rate, as well as certain manufactured articles at two-thirds of the full rate, became of direct benefit to such countries as India, West Africa, the West Indies, Australia, and South Africa, and, from the manufacturing point of view, Canada; although it is evident that further preferences should be granted if production in certain other raw materials and food stuffs is to be stimulated by these means. In any case, the action of the Imperial Government, tardy as it has been, is a direct and legitimate outcome of the new constructive imperialism which has been described in the foregoing chapter.

With the meeting of the Imperial Conference and the Imperial Economic Conference at the end of 1923 the policy of imperial consolidation was carried a step further than at any previous meetings; but the subsequent defeat of the British Government in December created a situation of the utmost difficulty and complexity, and placed in the melting pot all the economic resolutions that had been formulated. The difficulty of the position was specially emphasised in the case of the Dominions. Had they been independent foreign states negotiating with the British Government by means of treaties, succeeding ministries would have been more or less committed to the decisions arrived at during the Economic Conference however much they might have disapproved of them in principle; for the British Government cannot afford to throw over its accredited representatives as was done in the case of another and, perhaps, less highly organised democracy. But the Dominions and the mother country met as equals around the conference table, and their resolutions were subject to the ultimate approval of the democratic parliaments to which they would be referred. Whether this is a

satisfactory or an unsatisfactory position it does not behove me to say. That such, however, was the position was frankly realised by Mr. Bruce, the Australian Prime Minister, in a speech before the Royal Colonial Institute on December 31, 1923, when he stated that he could not subscribe to the opinion that should Great Britain decide not to carry out the resolutions—so described—there would be something in the nature of a direct breach of faith. That, he said, “is a wrong conception of the whole idea of Imperial and Economic Conferences. That nations should be bound by anything that is done by their representatives at these conferences until that action has been confirmed by their respective governments, parliaments, and countries, is undemocratic, and is against the great principles that underly the whole spirit of the Imperial and Economic Conferences.” The view expressed by Mr. Bruce is, of course, perfectly correct, and it may be convenient for Dominion Governments to keep it before them at some future date. Nevertheless it is at least unfortunate, and may possibly be disastrous, if resolutions reached by accredited representatives, are to be upset when there is a change of government either in individual Dominions or in the mother country.

The resolutions of the Imperial and Economic Conference of 1923 fall naturally under eight headings. They deal with overseas settlement within the empire, co-operation in financial assistance to imperial development, Imperial preference, steps for the improvement of mutual trade, import of live stock, forestry, workmen's compensation, and the creation of machinery to carry on the work of the Economic Conference. In the matter of Imperial preference, the conference stabilised and extended the system initiated at the Imperial War Conference of 1917, and it is extremely interesting to note that the actual decisions of the conference closely synchronised with the recommendations that had been forwarded to it by the British Empire Producers' Organisation, an active body which represents the actual producers of the empire in contradistinction to the Federation of British Industries, which is more closely concerned with the manufacturers of the United Kingdom. It is not desirable here to deal with these resolutions

exhaustively. It is only necessary to state that they recognised the principles of preference, or increased existing preferences, on sugar, dried and preserved fruits, tobacco, and wine. Particularly significant was the stabilisation of the cash value of the present preference on empire-grown sugar for ten years, so long as the duty on foreign sugar does not fall below that level, and the increase and stabilisation of the preference on empire-grown tobacco.

The actual results of the conference, therefore, marked a distinct advance in the direction of the policy first enunciated by Joseph Chamberlain, without the unpopular food taxes that formed part of that policy; but it remains to be seen whether the people of the United Kingdom will eventually realise the enormous value of their imperial heritage and take adequate steps to develop its resources.



Arms of Tasmania.

CHAPTER II

RAILWAYS AND PRODUCTION

To what an extraordinary degree production may be fostered by efficient means of communication may be succinctly shown by two or three simple illustrations taken from recent railway developments in British colonies. In the year 1908, four years before the through railway from Lagos to Kano was officially opened, only four tons of ground-nuts were carried over the Nigerian Railway. So soon as the railway reached the great producing centres around Zaria, Maidobi, Badeggi, and Kano, there was an enormous increase in the export of ground-nuts, so that in 1917, over 47,000 tons were railed, producing a revenue of £172,000 for the railway. Similarly so soon as the short Busoga railway in the Uganda Protectorate was working (1912-13), the amount of cotton and cotton-seed carried over the Uganda railway from Lake Victoria to Mombasa increased from 2,831 tons to 17,461 tons in 1914-15; while the building in 1909-11 of the railway from Accra, through the eastern districts of the Gold Coast Colony, led to over 56,000 tons of cocoa being carried in 1917 to Accra for export to the markets of Europe. It is obvious, therefore, that it is unnecessary to emphasise the importance of railways as a means of agricultural development, for in most countries scarcely a line has been constructed into regions capable of successful development that has not justified itself, from the productive point of view, within a very few years of its existence. Where such a railway has been unsuccessful certain economic or political causes have been at work which have retarded local development in spite of the new means of communication. In the case of mineral developments railways may be regarded from a different angle of view for they have generally been constructed to known deposits of minerals which were only awaiting the advent of railway

communication in order that they might be successfully exploited.

In the present chapter it is proposed to consider railway development within the overseas empire mainly as a means for the extension of production; to examine briefly its effect upon the growth of trade and commerce; to consider the part railways have played and will play in the building up of the overseas community; to examine their position with regard to internal waterways; and generally to determine their effect as a civilising and developing medium in countries where the natives have been for many centuries in a stage of arrested growth, or in regions totally undeveloped or only partly developed. Our survey may best be commenced by a consideration of the railway and transport problems of British Africa, not because railway construction is any more necessary in Africa than in other parts of the Empire, but because railway development on the Dark Continent appeals more directly to the imagination than perhaps the more remarkable progress that has been made in countries of a more temperate climate, such as Canada and Australia, where railways have been an instrument in the building up of new communities and in the introduction of European settlers into regions that formerly were almost devoid of population. Moreover the difficulties contended with in Africa have been greater on the whole than has generally been the case in the Dominions. It may be well, therefore, to consider some of these preliminary difficulties before reviewing the present situation with respect to railways and production in Africa.

One of the most important factors in railway construction in Africa and other tropical regions is climate. Apart from the deleterious effect of a bad climate upon the labour employed in construction and upon the European personnel—difficulties that have been in special evidence in West Africa—climatic conditions have retarded railway construction owing to the fact that frequently it has not been realised that the building of a railway through an unhealthy region to the more tolerable inland plateaus is economically the best means of developing the trade of the country and thus rendering it worth while to fight the prevailing evil conditions by the means now at the disposal of medical and sanitary science.

This has been especially the case in those regions where railways have had to cross the malarious coastal flats on their way to the productive centres of the interior. The continent of Africa is in some respects like an inverted plate and may be considered as falling into three zones through which railways must pass if they are finally to reach the potentially rich areas which form the backbone of the continent. The first of these three zones consists of the generally low-lying coastal regions and alluvial flats which rise gradually, frequently through densely forested areas, to the second zone which constitutes the rim of the inverted plate. Originally and still very largely occupied by wet jungle, such as that of the Zambesi and Congo valleys, by the east coast tropical forests, or by the great forest areas of Western Africa, land at this altitude can never be healthy for Europeans; but it is generally a fine country for sugar, palm-products, cocoa, and rubber, and for numerous other tropical products, that are now used in everyday commerce. As has been noted, railways that traverse these regions are invaluable agents in clearing and developing the coastal areas and increasing their productive capacity—although in few cases has the experiment been tried of building lines more or less parallel to the coast, because the extension of African railways has been mainly towards the interior. Apart from South Africa, where coastal railways (such as the coastal lines through the sugar areas of Natal, the Port Elizabeth—Avontuur railway, and the Cape Central railway), have been a valuable agent in developing productive capacity, partly owing to the different topographical formation of the sub-continent; and apart from a few restricted districts in the Gold Coast and Sierra Leone; railways have been driven towards the second zone, which lies generally at an elevation of between 3000 and 5000 feet, or less in the case of West Africa, where the average height of the continent is much lower. Here, taking the eastern and south-western plateaus as our guide, it is evident that the problem is different; for Europeans can reside in these regions for a longer period, the climate is not so exhausting, and the conditions generally are much better than in many parts of India and certainly preferable to regions like the Malay States. This second zone includes a large part

of Nyasaland, Uganda, and East Africa generally ; and is characterised specially by cotton, tobacco, coffee, maize, and other important products. Advancing again towards the interior, and avoiding the great basin of the Congo, which lies without the British sphere, we reach the great plateau districts, generally over 5000 feet, covered with grass or thin forest, where white people can live and thrive in a climate that is bearable and in some areas delightful.

The Kenya Colony, through which the so-called Uganda railway climbs on its way to Lake Victoria, contains an enormous area of this country which is being developed by means of a railway that in the first instance was mainly built to reach the then practically unknown interior of Central Africa. It is evident that here railways have been of enormous importance as agents of economic expansion and European settlement, although progress has necessarily been slower owing to the fact that East African industry, unlike that of West Africa, has mainly had to be developed from the beginning. No large markets awaited the arrival of the railway, as was the case in Nigeria, and no great centres of population, apart from Uganda, were ready for immediate development. The mid-way regions over which the railway climbs before it drops towards the great lake were practically virgin soil, which owing to the absence of water-communication could be developed by one means only. There are several of these temperate highlands in tropical Africa and their importance in the economic development of the continent can hardly be over estimated, since each will become in turn a centre for civilisation and commerce from which development will proceed in every direction. But it is only as they are reached and crossed by railways and brought into direct touch with the markets of the world that—like the East African highlands—they will become the directing and energising centres of the surrounding and more tropical districts.

The effect of a railway upon the general health of a tropical country may be illustrated by the Beira-Mashonaland line, which, although it passes through Portuguese territory on its way to the plateau, is, nevertheless, a British concern. Though traversing essentially unhealthy coastal flats it has, by attracting an increasing European population, indirectly brought about the introduction

of better sanitary conditions. A comparison of Beira to-day, destined as it is to become the great distributing centre for Rhodesia and Nyasaland, with the Beira of a quarter of a century ago demonstrates that railway enterprise has a direct effect upon the health of the community. Where railways have crossed fly-infested districts they have diminished the loss of human and animal life, by restricting or abolishing the former systems of transportation over unhealthy roads and caravan routes; and it may be taken as an axiom that sanitary conditions, both for Europeans and natives, are vastly improved by the introduction of railways: plague, and, especially, famine, are averted; better conditions of existence are ensured for the white population; and it becomes easier to found and support a family as well as to make periodical visits to more healthy districts.

It is not possible to deal more than briefly with other factors that have retarded railway development in British Africa. Excessive rainfall has at times not only stopped railway construction but frequently causes great damage to the permanent way when built. Forests, which naturally flourish in the regions of greatest rainfall, are also a serious factor to be contended with; while the absence of a suitable labour-supply and the necessity for training natives in the practical work of building have not infrequently retarded construction.¹ Engineering difficulties need not, of course, be enlarged upon, since they occur in every country, but it should be noted that in some parts of Africa—such as the Central Lakes region—where railways are absolutely essential if the productive capacity of the country is to be tested, there are districts where ordinary railway construction seems to be almost impossible except at a prohibitive cost.

In considering the railways that have been built or are to be built in Africa or any of the newer countries of the British Empire, it must be remembered that the main difference between colonial railways (*i.e.* the first railways in new countries that economically are but little developed), and the ordinary railway in long

¹An example of this occurred during the construction of the Lower Congo Railway—a pioneer effort in tropical Africa—when labourers were imported from all over West Africa, and even China. The last fled from the unhealthy conditions, and attempted to walk back to China overland!

civilised countries, such, for example, as India, is that the former have primarily to create economic activity and intercourse, while the latter, which subserve existing economic conditions, fit in with previous communications and improve on them. In a poorly populated and undeveloped country such railway enterprise demands a certain time to develop its traffic, but though the immediate profits may be low at first, the consequences to economic life, the politico-economic uses to the community, the effect upon the natives, and the so-called indirect yield are often considerable from the outset. From this point of view colonial railways are to be regarded as of almost incalculable benefit to the community at large.

With regard to African railways generally it must be pointed out that just as the financial independence of the colonies in relation to the mother country varies between wide limits in different cases, and as the economic development of the respective colonies may vary considerably, and in one and the same colony may change materially with altered circumstances in a short time, so railroads in the different countries may be highly dissimilar in economic constitution, productive capacity, and administration. And just as certain countries after a longer or shorter period of development grow from insignificant and dependent colonies into independent and powerful States, so under similar conditions colonial railways rapidly lose their primitive character and alter their type completely. Thus, many of the railways of South Africa have passed out of the purely colonial stage, during which they were first and foremost instruments of development, into the stage where they may be said to be serving the needs of a settled community whose productive capacity may indeed be developed, but is not now primarily dependent for that development upon the construction of new railways.

The railways of South Africa present a notable example of railway-building for the purpose of furthering mineral production. The movement of the white population northwards preceded by many years the extension of railway communications, and the farmers who settled in the Transvaal or Orange Free State were more or less independent of foreign influences and were in no hurry

to link themselves economically with the outside world. It was not, therefore, until the discovery of diamonds at Kimberley and of gold on the Witwatersrand attracted a considerable mining population to those districts that the need for quicker and cheaper means of communication and for outlets from the interior to the coastal ports became pressing. The feverish railway activity of the eighties which culminated in Cecil Rhodes' politico-economic dream of a Cape-to-Cairo railway, was due to the tardy recognition that the great South African plateau contained untold mineral riches and that agricultural development would proceed simultaneously with the extension of mining enterprise. Four railways were pushed northwards through British territory, from the ports of Cape Town, Port Elizabeth, East London, and Durban, but it was not until 1892, that the railways in the Transvaal were linked with the South African system, and several more years were to elapse before Buluwayo (1897), and Salisbury (1902), were to be joined with the southern railways. In both cases it was mineral wealth which determined their advance; and the more recent extension of the South African system (that is, the railways of the Union and the Rhodesian railways), northwards over the Zambesi (1904), near the Victoria Falls, and thence via the Wankie coalfields and Broken Hill (1906), to Katanga (1909), the southern province of the Belgian Congo, has been due to the wealth in copper of the Katanga regions. It is now possible to travel 2156 miles through British territory to the Congo frontier, and thence to continue the journey, partly by train and partly by water, to the mouth of the Congo—a truly stupendous achievement, due almost entirely to the magnet of wealth hidden in the earth rather than to the desire for increasing agricultural production. Similarly, the extension of railways northwards to Messina in the extreme north of the Transvaal was due to the necessity for bringing the copper deposits of Messina into direct touch with the coasts.

But though railways in South Africa have been built largely for the exploitation of minerals, they have taken a most important part in the agricultural development of the Union and of Rhodesia. Numerous purely agricultural lines have been constructed for the purpose of

bringing produce to the main railways and there are now, comparatively speaking, few considerable districts of the Union that are without railway communications.

Passing in rapid survey the railways of British Africa, it may be well to examine a great railway that has almost entirely subserved agricultural needs. The Uganda railway, which up to 1917 had cost £6,407,000 for construction, was built for the primary purpose of reaching Lake Victoria, and it formed the first of the numerous great railways which will eventually strike at the heart of Africa from the most accessible harbours on the coasts. The tonnage of all goods and produce carried to the coast over the Uganda Railway increased from 14,363 tons in 1905-6, to 183,724 tons in 1922; the principal items in their order of importance illustrating the economic growth of the country--cotton, maize, coffee, fibres, ground-nuts, hides and skins, and simsim. Across the north-east end of Lake Victoria the Busoga railway links the lake with the navigable waters of the Somerset Nile and Lake Kioga, and provides the means whereby the greater part of the cotton crop of Uganda reaches the main railway to Mombasa. The Uganda Railway has proved an illustration of Cecil Rhodes' axiom that "railways in the colonies are cheaper and more efficacious than guns," as undoubtedly it has been instrumental in preserving the peace in East Africa and Uganda. The wild Kikuyu warriors have become peaceful and partially industrious folk, and the once dreaded spear-armed Masai are now harmless pastoralists who have shown little inclination to resume their former warlike depredations.

Other railways built almost entirely for agricultural production include the great line running 704 miles from Iddo (opposite Lagos) to Kano in Nigeria--a railway that must eventually be extended towards the rich cotton lands around Lake Chad. This, like the Uganda railway, has proved a powerful civilising medium. Its extraordinary economic success as an agent of production is shown by the great increase that has taken place in the carriage of the principal commodities since the year 1906 compared with 1917--palm-kernels from 17,000 tons to 45,000 tons, cocoa from nothing to 12,000 tons, beans from

37 tons to 5733 tons, hides from nothing to 4000 tons, kola nuts from 1 ton to 4500 tons, and shea nuts from nothing to 2700 tons, as well as by the enormous growth in the traffic in ground-nuts; the total tonnage carried having increased no less than five-fold within ten years. Other examples of almost purely agricultural lines are the Sierra Leone railways, the eastern line in the Gold Coast, the railway from Nyasaland to the Zambesi and thence to Beira, which is the great coastal outlet for Rhodesia, and the railways in the Anglo-Egyptian Sudan. The last, which were first built hastily towards Khartoum for strategic and political reasons, were afterwards extended southwards for a variety of reasons, economic and strategic. The Sudan lines well illustrate the value of railway extensions for tapping productive centres. The cost of the transport of food-stuffs to Khartoum made it desirable to reach the sources of supply south of Wad-Medani. Almost famine prices ruled in the markets of Omdurman while at Gedaref grain was so plentiful as to be wellnigh unsaleable. The railway was therefore extended southwards and it has continuously been carried in that direction until it now extends into Kordofan and will eventually be built through Darfur. An outlet to the sea was provided by the building of a railway to Port Sudan on the Red Sea. The economic effects of these railways have been remarkable. The receipts from traffic and goods increased from £146,000 in 1900 to £824,000 in 1916, and the tonnage of goods carried from 134,000 in 1907 to 286,000 in 1916; the chief products being millet, simsim, and cotton. For the development of the last crop both in the Tokar district and in the Kassala province new railways are being built, especially a line from Kassala to Thamian on the Port Sudan railway.

While in tropical Africa railways have been built as a rule for agricultural development, there are a few—such as the line from Secondee to Taquah and Prestea, and to Coomassie in Ashanti; the railway from Port Harcourt in Nigeria to the Udi coalfields; and the line from Baro to Bukuru, also in Nigeria—which have been determined primarily by mineral production. It is not possible, however, to consider any of these railways in detail, although before passing to other continents the

needs of African railway extension should be briefly examined.

In considering the extension of railway communications in Africa so as to increase the productive capacity of the British Empire, it becomes evident that there are numerous "undeveloped estates" of the greatest potential value as reserves of raw materials and food-stuffs that are as yet almost entirely beyond the reach of practical economics. The first of these areas is the great healthy highland of North Eastern Rhodesia, lying at an altitude of over 5000 feet and containing an area of from 12,000 to 15,000 square miles capable of agricultural development and also suitable for the settlement of Europeans. Attached to this area and forming a northward extension of it is the plateau lying north-east of Lake Nyasa in the Tanganyika Territory, which, although less suitable than the former district is nevertheless capable of considerable development, especially for fibre plants. Both these regions require a direct line of communication with the expanding markets of the Transvaal and Rhodesia and with the sea. A railway from a point north of Broken Hill, to Kasama, Abercorn, and Lake Tanganyika, and a connection between Tanganyika and Nyasa, would open a vast territory to practical enterprise and give another outlet to the magnificent waterway, 1000 miles long, which lies so conveniently between the Tanganyika Territory and the Belgian Congo.

The great lake district itself, probably the most valuable undeveloped portion of the whole of tropical Africa, contains enormous areas that can only become productive when railways have connected the interior waterways in what will become an almost unrivalled series of communications second only to the great lakes of North America. Apart from the well populated and fertile region known as Ruanda-Urundi which has been granted to Belgium as a mandated territory—an area situated at the economic keypoint of Central Africa—the region farther north and lying east of Lake Edward will become a most valuable plantation country. Here on the grassy and thinly forested highlands of Ankole is a healthy and invigorating area situated south-west of the lower and more thickly peopled portions of Uganda,

which rises gradually to the snow-capped peaks of mighty Ruwenzori and extends northwards through Toro to Lake Albert. Sooner or later this great territory must be provided with railways as undoubtedly the whole region stretching southward from the Victoria Nile and lying between Lake Victoria and the eastern lakes forms what may well become in the near future the economic centre of Africa, and the most important avenue of communications from north to south, and from east to west.

It is not proposed to discuss the various railway routes that have been suggested but it may be taken as certain that one of the main lines of the Cape-to-Cairo route will strike across from Tabora, which although in Tanganyika itself marks the eastern limit of the basin of the Congo, to the bend of the navigable Kagera River, and thence proceed northwards to the Nile. To emphasise the importance of this region and of its future lines of communication is unnecessary to those who realise the potential value of this portion of tropical Africa; but it may be mentioned that the region offers practically a limitless field for maize, as well as rice, wheat, and oats, for beans and peas, ground-nuts, and cotton and other fibres, and that railway communications without doubt by increasing production and rendering it possible to rail produce to the ports, would reduce the cost of living in the United Kingdom, the high cost of which is partly due to the price of winter feeding-stuffs. In Central Africa and Western Africa lies the crux of the whole position.

In the Anglo-Egyptian Sudan and on its southern borders lies another great area which only requires efficient communications to render it of extreme value: but here development must necessarily be slower than in the territory just described because it is much more unhealthy and is not capable of settlement by Europeans. On the east of the White Nile, there are grass plateaus and fertile and well-watered valleys, but in the actual Sudd regions of the Nile great areas are covered with swamps during the rains and reclamation at best can be but a slow and costly process, not likely to be undertaken until the economic pressure of Europe becomes much greater than it is at present. But certain distinguished authorities have long realised the potentialities of this great area. "From Lado to Khartoum," wrote Sir

William Willcocks some years ago, "will be one unbroken stream about 500 metres in width, of pure and wholesome water, with long rows of willows by the water-side on every bank. The Sudd regions and the Sudd marshes even, in great part, will have ceased to exist, and in their place will be the beginning of millions of acres of rice fields and water-nuts." This is a vision of the future, but nevertheless it is certain that the canalising of the Nile, however costly the operation, would be of enormous and ever-increasing economic benefit to mankind, and that in the indirect return, owing to the great increase in production, it would pay for itself over and over again.¹ Some years ago Sir William Garstin made a report on this matter and estimated that the cost would be £16,000,000. His report has been severely criticised in certain quarters, owing to the high cost of the engineering operations, but whether his estimate be excessive or too low, there can be no doubt that this is a work that should be undertaken at no distant date. At present Uganda is wholly dependent upon the railway from Mombasa to Kisumu on Lake Victoria, which is at times in a hopelessly congested condition, and the Uganda cotton crop, which it must be remembered is as yet only in its infancy, could not be handled on the existing railway, if the output were to increase largely in the future. With a direct water-route to the Mediterranean, the whole position would be revolutionised and much of the 36 million acres of uncultivated land in Uganda alone could be placed under profitable production. The country could then supply a large part of the wants of Lancashire in raw cotton; its sugar production, which has only just started, would become a most important factor in the markets of the world; and the richest portions of Central Africa would be rapidly developed, more especially as they do not lack population as does the Anglo-Egyptian Sudan farther north. In that country the wonderfully fertile district between the White and Blue Nile known as the Gezira is already in process of development as a cotton area, and the Blue Nile dam is being constructed so as to bring water to the Gezira plain.

It cannot be doubted that the best way to expand

¹ Some analogy may be found in the highly successful canal systems in Canada.

British control over the headwaters of the Nile, is the establishment of alternative routes to the present Uganda Railway. The two small lines actually in Uganda (the Busoga and Port Bell railways), are worked expensively and their rates are high. It is certain that a northwards waterborne traffic over the Nile should cost for transport very much less than the heavy charges to Mombasa, and if such a route were developed the vast resources of Uganda in cotton, flax, fibres, coffee, rice, and numerous other food-stuffs or raw materials would soon be finding their way to Alexandria for shipment to Europe. The engineering aspects of the problem are at present undefined but it may be said that only the Ripon and Murchison falls and the various rapids constitute obstacles of magnitude. In any case the elaborate system of locks and dams contemplated by the Commonwealth of Australia for rendering the Murray River navigable for 2000 miles, would be unnecessary on a river like the Nile, with a perennial flow of water from the Central African and Abyssinian highlands.

In connection with river transport in Africa it should be realised that there are numerous great waterways that might be developed with much advantage. Long sections of the Zambesi and some of its tributaries are available for water transport, and although the lower Zambesi is becoming difficult for navigation it is by no means certain that engineering science is incapable of overcoming this increasing drawback. Similarly the lower Niger and the Benue form a great navigable waterway in Nigeria, while the Gambia river is one of the greatest assets of British West Africa could it only be efficiently developed in connection with railway services. Here, however, political factors with regard to the French hinterland of the Gambia Colony are likely to prove insuperable.

Without doubt for African conditions railway transport is the best means for developing production. If it can be worked in conjunction with motor lorries and water transport so much the better. Motor lorries are certainly effective in bringing produce to railhead, but it is difficult to suppose that any country can remain dependent upon this means, owing to their cost and the expense of maintaining heavily metalled roads. In Ashanti and the Northern Territories of the Gold Coast,

in certain parts of Nigeria, and in Uganda lorries are being effectively used, but they can only precede the construction of railways and never supersede them. The first effect of railways in new African countries is to release the gangs of porters engaged in carrying produce to the coasts or markets for agricultural work in their own villages. It has been computed by Mr. Frederic Shelford,¹ a competent authority, that to handle one thousand tons of produce daily over a distance of 150 miles would require 37,000 porters employed for at least seven days, whereas a railway could carry the same weight by running five trains of twelve wagons each in one day. Another authority² has estimated that an African goods train, with only 50 tons net load and a speed of at most 12.4 miles per hour equals during the day the work of 13,333 porters. The result of releasing natives from portering so that they can be employed on agricultural work is admirably illustrated in the Gold Coast Colony, where a great indigenous industry (cocoa-growing) sprang into being. The Cameroons, on the other hand, under German administration, with its poor railway development, remained a striking object-lesson of the way in which caravan traffic militated against any endeavour to make the population healthy and industrious. In that country an enormous toll was taken from the vitality and health of the human carriers and vast numbers were kept from agricultural production.

Before concluding our summary of the railways of Africa attention must be directed to certain railway developments of the near future. The first concerns Nyasaland where railway communications at present end at Blantyre in the south of the Protectorate, and do not reach the Lake. This line will be continued to Lake Nyasa, and will open a very extensive trading and planting area around Nyasa and westwards over a large extent of country. The second extension which will have to be undertaken in the near future is a railway from Salisbury in Rhodesia to join with the main northern Rhodesian line at, or in the neighbourhood of, the Kafue River. At present produce railed from Katanga or Northern Rhodesia has to make a long detour in order to

¹*Modern Transport*, February 2, 1920.

²*Baltzer's Kolonial und Kleinbahnen*, p. 21.

reach the sea at Beira. The building of a railway from the Kafue River to Salisbury would reduce the journey by about 587 miles, the distance between Elizabethville and Beira then being about 1032 miles instead of the present 1619 miles. The connection would also open a fertile territory with extensive possibilities of water-communication. The Kafue itself is navigable for 200 miles by fair-sized steamboats, and the Zambesi contains very long navigable sections. The third extension is the Uasin Gishu railway in Kenya, which is being built to develop that extensive and healthy plateau, and doubtless in time will be extended into Uganda and towards Fort Portal and the Congo borders. The fourth railway which will have to be undertaken, if previous engagements are to be honourably kept, is the railway across Swaziland, which is a fine agricultural country stated to be capable of growing cotton. In this connection the proposed new port on the Zululand coast and railway to the Transvaal may be alluded to, although nothing definite has been decided as to their construction.

In considering the railways of British Africa, it is evident that in one portion of the continent they have been built without any adequate consideration of the possibility of co-operation between scattered colonies. In South Africa and Rhodesia it has been possible to construct a main trunk system from south to north, but in West Africa, with its colonies divided from each other by wedges of foreign territory, and with their enormous French hinterland, each colony has pursued its own railway policy, with the result that there is neither uniformity of gauge, nor has there been an attempt to secure inter-communication by means of a railway from west to east over the high plateau of West Africa. Political causes have prevented, of course, the building of such a line, since there has been no co-operation with the French, through whose territory a railway of this nature would have to run. Nevertheless, if we take a broad view of the natural routes throughout West Africa it is evident that if politico-economic difficulties can ever be surmounted, a railway from Sierra Leone to Northern Nigeria would serve a useful purpose in opening for production the hinterlands of the British colonies, especially if it could be continued in an easterly direction past Lake Chad,

and through the French territory of Wadai, so as to join with the railways in the Anglo-Egyptian Sudan. So far-sighted an administrator as the late Sir William MacGregor, writing in 1901, stated, with respect to the Nigerian railway, that it must be carried "at least to the heart of the Hausa country, probably to Kano, and perhaps some day to the Nile." Kano has been reached, but Lake Chad and the Nile are still a long way from railhead. About the same time Sir Frederick Lugard, referring to French plans for a trans-Sahara line, emphasised the importance of at least reaching the neighbourhood of Lake Chad. It is not the place here to discuss the French Saharan projects nor to describe the very elaborate plans that have been adopted for railways from west to east throughout the French Sudan, and linking with railways from the coasts. It may be pointed out, however, that a railway across the Sahara would be of considerable importance in view of the proximity of Freetown and the French ports of Dakar and Konakry to South America. This is a world-route that the French have always kept in view, and so far as British territory is concerned it must be remembered that there would be very great advantages to Sierra Leone, if it were possible to link its railways with the projected French lines. A particularist policy in each of the British and French colonies in Africa with regard to possible through routes must be, in the long run, detrimental to the best interests of West Africa: but there are no present signs of any co-operation in railway policy between Great Britain and France, and the politico-economic situation seems almost definitely to preclude any agreement, however desirable it may appear.

The railway system of the Dominion of Canada presents one of the most striking object-lessons of the effects of private enterprise in opening and developing a new country, especially so far as Western Canada is concerned. In Africa most of the railways under consideration have been due to Governmental enterprise. They are, as a rule, State-owned and State-worked, the only outstanding exception being the Rhodesian railways, which are, however, the property of a subsidiary company of the British South Africa Company. In Canada, with one or two exceptions, such as the Intercolonial Railway in

Nova Scotia and New Brunswick, all the railways at the outset were privately owned although recent developments have brought the State prominently into the field of public ownership and now, with a few minor concerns, only the Canadian Pacific, the most successful of the Canadian railways, is privately owned. In Australia, on the other hand, the railways, with few exceptions, are State enterprises and have been so since their commencement.

It is not possible here to consider the Canadian railway system as a whole. It is sufficient to notice that there are a few nodal points in the Dominion which have a special importance from the transportation point of view. These points are Winnipeg, which from its position in the centre of Canada at the narrowing of the land surfaces of the Dominion has become the great railway centre between east and west; Port Arthur and Fort William, the great grain ports on Lake Superior; Montreal and Quebec, the summer ports on the St. Lawrence, which forms the great water highway of the Dominion, extending by means of the canals and the great lakes into the very heart of the country; Halifax and St. John, the principal Atlantic coastal termini; and Vancouver, the great Pacific terminus in British Columbia. If to these points be added Saskatoon, Regina, Edmonton, and Medicine Hat in the west, and Toronto and Hamilton in the east, with the new port of Prince Rupert, a place of great possibilities in view of the rapid extension of traffic over the Pacific that is bound to take place in the near future, all the great nodal points of Canadian traffic, with the exception of Sault Ste. Marie and the towns on the main routes to the United States, have been mentioned.

As it is impossible within a reasonable compass to deal otherwise than superficially with the problems presented by the abounding economic vitality of Canada, it will be well to concentrate attention upon three outstanding features of the railway conquest of the Dominion—the race to the Pacific, the effect of the opening of the Panama Canal, and the results of the extension of railways in Canada upon the production of the country. But before doing this it is necessary to understand the precise geographic features that have created the great centres of population in the Dominion. Quebec and Montreal,

owing to their strategic position on the only highway of commerce possessed by Canada prior to the advent of railways, were the predestined gateway to the interior. Toronto, lying as it does on Lake Ontario in the narrow isthmus between Georgian Bay and the most easterly of the great lakes, was destined to receive the commerce that sooner or later was bound to flow from the fertile lands of south-western Ontario. It is, therefore, the centre of a network of railways which radiate in all directions from what is now the second city of Canada. The twin cities of Port Arthur and Fort William, situated on the western shore of Lake Superior, owe their importance to the fact that they are the natural centres for the transfer of grain to the three great waterways—Lakes Superior, Michigan, and Huron—which form so valuable a link in the water-route to the south and east ; while Winnipeg has become the centre of a vast system of railway transport and looks on the map like some great octopus throwing out its tentacles in all directions in order to draw in the commerce of western and eastern Canada. Situated as it is in the centre of the narrow territory between the two great lakes of Manitoba and Winnipeg and the American frontiers, it became the natural meeting-place of east and west, passing on the populations of Europe to the vast plains of Manitoba, Saskatchewan, and Alberta, and returning to the east the products of their industry. Winnipeg is, in fact, the connecting link which joins together the two halves of Canada, and through its immediate neighbourhood almost the whole through traffic of the Dominion is bound to flow. A glance at the map shows that Canada is here divided into two fairly equal portions and that Winnipeg is like the waist of an hour-glass, the two ends of which are constantly expanding.

The Canadian Dominion is now crossed by three trans-continental railways. Although the Grand Trunk system is the pioneer railway of Canada, it was left behind in the race to the west, and the motive which primarily dictated the building of the Canadian Pacific, the first transcontinental railway in Canada, although economic success was certainly a factor in view, was mainly political. British Columbia, in the far west, potentially the wealthiest of the Canadian provinces, became a province of the Dominion on the understanding that railway

connection should be established across the great undeveloped plains of the Middle West, and over the waste of rocks and forests that barred the approach to the Pacific coasts. The geographical relationship of Western Canada, especially the longitudinal mountain zone, is rather with American territory to the south than with the eastern provinces, from which British Columbia was even more isolated than Western Australia was from New South Wales, since no direct sea-route connected them. The one great dominating result, therefore, of the building of the Canadian Pacific, apart from the enormous agricultural activity it called into being in the great wheat areas of Western Canada, was that it preserved Western Canada and British Columbia, both economically and politically, to the British Empire and bound together in one great Dominion the whole of British North America.

That the Canadian Pacific, with its great resources in the lands that were allotted to the company as a consideration for the building of the line, has been a conspicuous economic success it is almost needless to state. Its construction was followed by the building of other transcontinental lines—the Grand Trunk Pacific which finds its outlet at Prince Rupert, and the Canadian Northern which has been carried by a middle route to Vancouver. The importance of these three railways with regard to the development of the trade of the Pacific is apparent to all who are watching the economic development of the Far East.

British Columbia, which for many years was regarded as the back door of Canada, and the outlet upon the Pacific for those who make the long railway journey across the Dominion and for a comparatively small and as yet inconsiderable portion of the products of the interior, may be looked upon in the not distant future as the front door of the Dominion. Its ice-free ports will be crowded with shipping—even now practically all the ocean steamship lines operating in the Pacific use the ports of Vancouver and Victoria—and much of the wheat of Western Canada, west of an economic divide which will quickly establish itself at a point on the central plains, will flow naturally and inevitably towards the Pacific littoral. The making of the Panama Canal, shortening as it has done the sea journey from Liverpool to Victoria and Vancouver,

will contribute enormously to this result. A difference of nearly 8000 miles between the old long sea route from Liverpool to Victoria and the nearness of the British Columbian coasts to the great wheat areas cannot fail, as sea-freights adjust themselves to economic conditions, to bring about a complete readjustment of freight traffic throughout Western Canada. A glance across the Pacific to the shores of China and Japan, and even to India, to which regular steamship services are running, cannot fail to convince the economist of the enormous potentialities of trans-Pacific trade and to demonstrate the commanding position of British Columbia on the new world routes.¹

Even now with regard to the transport of the wheat which the railways of Canada have called into being, the western route has become a factor in carrying grain to Europe. The enormous quantity of grain grown in Western Canada and the difficulty of shipping it all by the eastern route, owing to the shortness of the period during which open navigation is possible, added to the long haul over the railways, have led to the hope that the Panama Canal will be a great gain to the farmers of Alberta. When wheat was first exported from Western

¹ Some years before the Federation of Canada, Joseph Howe, the Nova Scotian statesman, had spoken strongly and with a full belief in the future of the then disunited and politically antagonistic colonies, with regard to the importance of a railway to the Pacific, while some years later Sir Edward Watkin, who was sent to Canada in 1861 to report upon the affairs of the Grand Trunk Railway Company, wrote that in his opinion only one way was open to make a success of the venture. "That way to many," he stated, "would be chimerical; to some, incomprehensible; and possibly I may be looked upon myself as somewhat visionary for even suggesting it. That way, however, to my mind, lies through the extension of railway communication to the Pacific. Try for one moment to realise China opened to British commerce; Japan also opened; the new goldfields in our own territory on the extreme west, and California, also within reach; India, our Australian Colonies—all our Eastern Empire, in fact, material and moral, and dependent (as at present it too much is) upon an overland communication through a foreign state. Try to realise again . . . a main through railway . . . from the shores of the Atlantic to those of the Pacific made just within the corn-growing latitude. The result to this Empire would be beyond calculation." These views must have appeared as far-fetched and unsubstantial then, as the possibility of air-routes across the North Pole from Europe to Asia and America may seem at the present time—yet it is to such far-sighted instinct as that of men like Edward Watkin and, on another continent, Cecil Rhodes, that we owe a great part of the value of our imperial heritage of to-day.

Canada it was hauled by the farmer to warehouses, built by grain-dealers at convenient points along the line. With the extension of railways enormous elevators were constructed and these were designed to take advantage of the flowing property of grain in bulk, so that it was possible to handle wheat much more easily than in a primitive warehouse. Practically all the grain exported from Canada is now sent unsacked to the elevators, where it is dealt with in bulk, the most important elevators being at Fort William and Port Arthur, with storage capacity for about 53,000,000 bushels, which is about the amount that is exported to Europe by the American route. With the extension of transcontinental lines it became necessary to provide elevators for grain proceeding by the western route, such as those at Moosejaw, Saskatoon, Calgary, and Vancouver, which have a total capacity of over 10,000,000 bushels. These form the distributing centres for grain that is shipped across the Pacific or through the Panama Canal.

Perhaps nothing illustrates better the enormous railway development in Canada, than the number of lines that have been projected but have not yet reached the constructive stages. If a map of Canada could be made showing the routes of these projected railways, the greater part of the Dominion would be covered by an intricate series of lines crossing and re-crossing each other and connecting all the chief centres of population and many other places which are now unpeopled wastes, but present fertile possibilities in the active brain of the speculators. This series of projected railways is not confined to the settled portions of the Dominion, for Canada has long passed the stage when it was a country of length without breadth, with a population scattered along the Canadian Pacific Railway, and never very far from the United States boundary. The inhabited portions of Canada are ever advancing northward, and the greatness of the Dominion is not now a question of a vast territory stretching from the American frontiers to the Arctic Ocean, but consists in an ever-increasing population spreading east and west and north and south. The projected railways are not only intended to serve the present peopled districts, but they are thrust right into the Arctic fastnesses of the Dominion.

Shortly before, and during and since the war, there has been a slump in railway construction. Numerous railways that were projected have been abandoned, at any rate for the time being, and others are not likely to be constructed during the present generation. No scheme of railway construction was more discussed than the project for building a railway to some point on Hudson Bay in order to relieve the volume of grain traffic eastwards, which sets in during the autumn months. Scheme after scheme was brought forward and, with the exception of the Canadian Pacific Company, which has apparently looked askance at any move in this direction, practically every interested railway company elaborated plans for building a line to Hudson Bay.¹ Shortly before the war the Canadian government, responding to pressure from the West, started the construction of a line to Port Nelson on Hudson Bay. While the disadvantages of this route are obvious, owing to the very short time during which the Bay is open for navigation, its advantages are equally apparent, because there is a great saving in railway haulage—being a gain of one thousand miles from Edmonton over the route to Montreal. At the present time, however, this railway is still in the sphere of unaccomplished ideals. By the end of 1920, only 332 miles of rail had been laid, out of a total length of 424 miles, and only 214 miles were being operated, and that at a considerable loss on working costs, without taking into account the interest on over £1,000,000 of capital expenditure on the line itself, and the terminals at Port Nelson. In any case the Hudson Bay railway appears to be unlikely for some time to fulfil the hopes of its original promoters, but if completed, it should at least prove a useful outlet for northern Manitoba, and portions of northern Ontario.

It may be interesting here to examine briefly the productive result of the construction of Canadian railways. In 1871 the wheat production of Canada was only 16,723,000 bushels and of oats 42,489,000 bushels. By 1912 these amounts had grown to 300,858,000 bushels and 426,232,000 bushels respectively; and the acreage under wheat had increased from 1,646,000 to 23,261,000

¹ For a discussion of these plans, see an article by the present writer in *United Empire* for December, 1912.

in the same period. In 1921, the total amount of wheat exported to all countries was 129,215,000 bushels, of which about 30,000,000 were sent on order to Europe by the eastern route, about 54,000,000 bushels by the American route, and about 42,000,000 bushels went to swell the American markets. In all 7,323,000 tons of wheat were carried over the Canadian railways in 1920, out of a total of 20,000,000 tons of agricultural produce. The total tonnage carried over the railways in that year was 127,429,000, of which 41,000,000 tons represented mineral products, 21,000,000 tons were products of the forests, and as above stated, 20,000,000 tons were agricultural produce. It must be noted, however, that grain bulks largely and is therefore far more important than it looks in terms of mere tonnage. Practically the whole of this enormous development has been due to the policy of fostering railway enterprise in Canada— a policy first effectively supported by the British Government when it loaned money on very cheap terms for the construction of railways in Nova Scotia and New Brunswick.

There can be no doubt that the land-grant system under which many of the Canadian railways have been built has been instrumental in effecting the settlement of large areas that otherwise might still have remained unpeopled. In all over 58,000,000 acres have been allotted as land-grants to railways. Almost everywhere that a railway was pushed forward, except during the period when useless or at least premature duplication of railways in certain districts brought about the crisis that has only recently been adjusted, new communities sprang into existence. "So keenly has settlement, in some instances, followed even the planning of a railway, that construction trains on the Grand Trunk Pacific, carrying ballast and materials to the head of the new line, sometimes also hauled trucks to be loaded with the first crop of grain from new land, which was broken by the plow before the railway had reached it."

Finally, with regard to Canada it should be said that canal traffic, which during recent years has become of less importance owing to a variety of causes, economic or political, than was the case a few years ago, is again likely to increase in value. The marked decrease in the tonnage carried over the Canadian canals is due, among

other causes, to the depression of the iron industry and to the improved facilities offered by the American Sault Ste. Marie Canal. While Canada is peculiarly fortunate in the fact that proportionately more attention has been given to railway construction than in almost any other country in the world—there are 40,000 miles of railways to a population of nearly 8,000,000—because its growth depended largely upon solving the problem of transportation across its enormous area, it is also particularly fortunate in the possession of a vast series of waterways, which at comparatively small cost have been joined together by canals. What is so urgently required in connection with the waters of the Nile, has long been achieved in Canada, where by a system of canals the rapids of the St. Lawrence, the Niagara Falls, and the rapids of Sault Ste. Marie were successfully evaded; the great lakes were joined together into one important system of internal communications; and a way made to the St. Lawrence via Montreal. This water route through the lakes is of great importance for the import and export of bulk commodities, such as coal, iron ore, and grain, and a very large proportion of the grain of Western Canada finds its way to the elevators of Port Arthur and Fort William before being shipped across the lakes.

While railway development in the premier Dominion has proceeded mainly from east to west in order to carry civilisation and production to the far-distant interior of the continent, the contrary has been the case in the Commonwealth of Australia where, with few exceptions, railways do not extend to any great distance from the coasts. This is due, of course, to the fact that the interior of Australia is largely desert or semi-desert. There has been no need, therefore, to direct railways to distant objectives in the interior, while the immense coast-line of the continent has offered far more numerous points of penetration than has been possible in Canada with its restricted eastern littoral. If we examine the railway system of the Commonwealth in detail it will be found to present many glaring instances of mistakes with regard to construction and of futile political and economic policy; but considered on the whole the Australian railways have rendered notable service to the community and compared with any other country

Australia easily leads in the mileage per head of the population, there being 4.90 miles per thousand inhabitants compared with 4.37 in Canada, the nearest competitor in mileage per head amongst the countries of the world. Or considered from another point of view, there are 8.73 miles of railway for each thousand square miles of country compared with 195 miles in the United Kingdom. This is, of course, a notable achievement in a new country and one of which any nation may be proud, especially when it is remembered that the actual length of railways in the Commonwealth, some 26,000 miles, is greater than the total length in the mother country.

But compared with the Dominion of Canada the railway system of Australia suffers from three notable defects. Until the federation of the Commonwealth led to the initiation of some attempt at a unified railway policy, each State was responsible, and still is, for its own railways. There arose, therefore, a particularist policy in every State in Australia, and each strove to promote railway communication without reference to the economic needs of the country as a whole. Moreover, particularist policies were followed even within certain areas of each State, and political or economic pressure exerted in the local parliaments was frequently sufficient to secure the diversion of railways from their natural routes into areas that did not correspond with proved or anticipated development. Production, therefore, was not always a primary factor of railway development, the State suffered economically, while districts that should have been developed were left out in the cold because they had not sufficient "pull" over the politicians. This subject need not be pursued further except to state that the concentration of traffic on the great capitals has been a profound mistake from the national point of view, and has done as much to hinder Australian development and settlement as any other factors of the national life. The example of New South Wales, where almost all the railway development has been designed to lead to and foster the special interests of Sydney in spite of the fact that many other excellent harbours—such as Coff's Harbour, Jervis Bay, and Twofold Bay—might have been utilised, has been followed to a less extent in the other States, with the result that production has been hindered

in districts equally as capable of development as those favoured regions brought into direct contact with the capitals. . In addition the mutual jealousies between the different States have led in certain cases to the creation of absurd situations, such, for example, as when Victoria built several parallel lines to the north-western borders and failed to come to any agreement with New South Wales, whereby they could be joined with that system so that traffic might be left to find the best and most economical route to the sea. Such developments have been a restriction on production rather than an aid to rapid development, and the policy of retaining for each State the traffic arising therein has been fraught with much economic danger to the country at large.

This has especially been the case in the fertile country to the north of the Murray River—land which has virtually been locked up since 1851—where the settlers have for many years been protesting against the failure of the governments to break down the artificial barriers of State boundaries. In 1922, however, both States came to an agreement, and the settlers in these border districts will soon be able to rail their produce to the south instead of being obliged as heretofore to send it by the long route to Sydney. The new railway scheme will open vast areas of land, as the general idea is to extend the existing Victorian lines across the Murray into New South Wales. About 5000 square miles of country suitable for closer settlement will thus be brought into contact with the south and another 10,000 square miles suitable for grazing will be brought into closer touch with railway communication. The only case hitherto where an Australian State has been ready to forgo the privilege of bringing transport to its own capital has been with regard to the celebrated mines at Broken Hill, which, being situated in the extreme east of New South Wales, were connected by rail with Port Pirie in South Australia—the nearest natural outlet—instead of Sydney. The New South Wales Railways are, however, being extended in this direction also, though mineral traffic will certainly continue to flow towards Spencer Gulf.

Secondly, the lack of co-ordination between the different States in building railways has led to an almost Gilbertian situation, whereby each State has its own

gauge and cannot utilise the railways of its neighbours. Thus in a railway journey from Queensland to Western Australia, which is now possible owing to the construction of the Trans-Australian Railway from Kalgoorlie to Port Augusta, which joins together the Western and South Australian systems, one first travels on a 3 ft. 6 in. gauge in Queensland, then on a 4 ft. 8½ in. gauge in New South Wales, then on a 5 ft. 3 in. gauge in Victoria, then on a 3 ft. 6 in. gauge in South Australia, then on a 4 ft. 8½ in. gauge over the Trans-Australian system, reverting to the 3 ft. 6 in. gauge in Western Australia—five breaks of gauge during a journey which only those who are bad sailors and thus wish to avoid the sea-route would ever think of making. The economic waste of this system and the strategic danger need not be emphasised.

Thirdly, railways in Australia have generally followed settlement instead of having been the pioneers of production. "In the Australian States agricultural settlement and development have been from the outset prevented and retarded by an astonishingly unenlightened and inefficient railway policy. While railways in all other new countries have preceded settlement, settlement in all the Australian States has been obliged to go ahead and cry loud and long for government railways." ¹ As a rule they have not been built to open new territory but to provide, frequently after prolonged political pressure, facilities for districts in which population had already been established and which were languishing for want of communications. There are exceptions to this general principle, especially in Victoria and New South Wales, but there exist no great lines built with a belief in future development such as the Canadian Pacific, Grand Trunk, or Canadian Northern (now National) railways. The only transcontinental line was built primarily for strategic reasons and is of no present use whatever for purposes of production. In fact, like the almost derelict line to Oodnadatta in the centre of Australia, which will eventually be continued right across the continent from south to north, it costs more to work than it produces in revenue, without taking into account the immense capital that has been sunk in the enterprise. It does not, as is frequently supposed, pass through hopelessly barren territory. On

¹Edwin Pratt. *The State Railway Muddle in Australia*. 1912.

the contrary there is great promise in certain of the areas it traverses, but in the words of an official report, "the financial position of the railway is seriously affected and its utility largely nullified by breaking of gauge on either side." With respect to this line Sir Archibald Weigall, then Governor of South Australia, wrote in 1920, that "the sunshine and atmosphere were exhilarating, yet to me it was very sad to see these large tracts of country with apparently every sort of potentiality lying idle. What a tragedy it is that this country cannot be developed."

The Port Augusta-Oonadatta line, like the Trans-Australian and Northern Territory railway, is owned by the Commonwealth Government in contradistinction to the State governments. As a productive railway it is very far from being a success. Although it has cost some £2,282,000 it only earns about £74,000 per annum while its annual expenditure is £112,000.

It must not be supposed that Australian railways, although they do not produce any considerable revenue, in spite of the fact that they greatly benefit by the large suburban traffic of such centres of population as Sydney and Melbourne, have been ineffective instruments of production. On the contrary frequently they pass through districts whose prosperity has been greatly enhanced since they were originally built, sometimes to such an extent that rolling-stock and storage capacity have proved, season after season, totally inefficient to deal with the accumulated harvests¹—as is at present the case in another part of the British Empire, Nigeria. So much has this been the case in New South Wales and to a less extent in Victoria that the severest criticisms have been passed on the railway authorities for their want of initiative in providing the necessary rolling stock. In addition many short lines have been directly instrumental in opening-out new districts. Two examples only need be quoted here—the railways built in South Australia to Port Lincoln on the western side of Spencer Gulf in order to develop an area that at one time was regarded as more or less useless, but is now a rich wheat-growing

¹This defect, of course, can be remedied at any time by providing sufficient transport for the produce, necessitating, however, the expenditure of considerable sums of money.

region, and the light railways which are being constructed in New South Wales in districts where soldier-settlers are being placed in furtherance of plans for the development of regions that hitherto have been beyond the scope of effective agricultural settlement.

It has been noticed with regard to the Australian railways that most of them converge on large centres of population situated on, or very close to, the coasts and forming the principal outlets of the various States. In the case of New South Wales a railway certainly runs close to the central and more northerly coasts, joining together a number of small ports, but the hinterland which should be sending its produce to these ports is not connected with them and port development is, therefore, comparatively slow and inefficient and mainly dependent upon purely local industries. The case of Newcastle, the coal port, with smelting works, lying north of Sydney at the mouth of the Hunter River, is somewhat different as it serves a considerable hinterland. In Victoria, too, there is a number of small ports independent of Melbourne, such as Port Albert and Warrnambool, the latter the outlet of a rich agricultural and pastoral district, while Geelong, in spite of its proximity to Melbourne, has been developed as an important seaport. In South Australia both Port Augusta and Port Pirie, situated on Spencer Gulf, have been developed; the former largely owing to its natural position, fine harbour, and mineral wealth, the latter as the outlet for Broken Hill and also for a considerable wheat producing area. Queensland, however, is in a distinctly different category, as the general scheme has been to run lines inland, more or less parallel to each other, from the several ports of Brisbane, Rockhampton, Townsville, Cairns, and Cooktown, and then to join these together by a coastal railway. Some of these lines in addition to serving rich agricultural districts are connected with important mining areas, such as the railway from Townsville to Charters Towers and beyond and the line from Cairns. This has been a much sounder system than that followed in other States, though in a country like Queensland a policy of concentration could hardly have been followed owing to the fact that the capital is in the extreme south of the State.

Having considered the Australian railways in so far

as they have aided or retarded development, some attention should be devoted to water-transport on the island-continent. For a country of such enormous extent Australia is singularly ill provided with waterways. No great lakes or rivers comparable with those in North America or Central Africa offer facilities for water-transport, and in this respect Australia can only be compared with South Africa. Such means of water communication as exist have hitherto not been adequately developed. The Murray-Darling system, which affords a means for a considerable amount of traffic, and would undoubtedly open great tracts of country could it be really effectively used, can only become an efficient means of communication when the Murray, Darling, Murrumbidgee, and Lachlan Rivers are provided with locks. And here the question of irrigation versus water-transport becomes a factor of the highest importance. Inter-State Commissions have considered the question both from the point of view of navigation and irrigation ; but it is generally agreed that in view of the high cost the locking of the rivers would not be a profitable undertaking from the navigation point of view. Yet the indirect return might be very large, and after all—in view of non-profitable expenditure on trans-continental railways built for almost purely strategic purposes—to attempt to secure direct profit to the State is not infrequently in the long run a false policy. By increasing railway rates in the hope of paying adequate interest on the capital that has been sunk, production is frequently hampered in districts where only the cheapest rates can be effective in encouraging agriculture.

In New Zealand railway development has proceeded largely upon the plan followed in Queensland, with a main coastal line in the South Island having numerous branches running inland, more especially in the south. In the north and south of this Island the railways are at present isolated, but they will eventually be joined in one system. The indented coast-line with its numerous fine harbours has been, of course, a direct incentive to this method of construction ; as Invercargill, Dunedin, Oamaru, Timaru, Christchurch, with its seaport Lyttelton, Nelson, and Greymouth, in the South Island ; and Wellington, Napier, New Plymouth, and Auckland, in

the North Island, form the natural outlets for extensive agricultural or mineral districts. There has thus been no chance for the development of great centres of population dominating the interests of the agricultural settlers, as has been the case in Australia.

The policy followed in railway construction both from the point of view of production and distribution, has been a very sound one. While the railways have paid their way, they were looked upon primarily as an adjunct to the settlement of the country, and the development of its natural resources rather than as a means of increasing revenue or even paying an adequate interest on the money invested. For many years a profit of only 3 per cent. was regarded as sufficient and any excess over this rate was followed by reductions in fares and freights. Recently, however, higher returns have been aimed at and the railways now pay 4.53 per cent., which may be compared with the Australian total of 3.18 per cent., the smallness of the latter being partly due, however, to certain causes mentioned above and not to a deliberate policy of low rates.

At the present time there are 3,009 miles of State railways in New Zealand, and their recent progress as factors in production may be illustrated by the fact that in 1921 some 6,487,000 tons of goods were railed, compared with 3,667,000 tons in the year 1902. Of this amount 1,061,000 tons represented grain and 2,515,000 tons were mineral products.

Turning our attention briefly to India it will be seen that there the railway problem has been entirely different from that in any other country in the overseas Empire, with the possible exception of Nigeria and Malaya. The problem has been not to develop production in regions where before there was hardly any population, or to foster the settlement of newcomers upon the land, but to join together vast centres of population, to bring their products to the coasts, and to increase industries which, as a rule, were already in existence. The subject of Indian railways and production is too vast and complicated to be adequately dealt with in this volume, but it may be said at once, that they performed four very notable services for the Indian Empire. By improving methods of communication, they have enabled the

Government to fight more efficiently the disaster of famine in districts which before the advent of railways were too distant from the centres of distribution to be helped effectively ; they have enabled the products of the interior to be brought to the coasts to be exchanged for goods of European manufacture ; they have tended to bring about a greater community of interests between the extremely divergent types of people who constitute the vast population of India ; and they have been of great strategic value to the governing authorities.

The total length of railways in British India and the Native States amounts to nearly 37,000 miles—perhaps an inconsiderable figure when the great size of the country and its enormous population is taken into consideration. It is only during recent years that Indian railways, as a whole, have been really successful financially ; as for many years they were a drain upon the finances of the country. The reasons for this want of success in a land of such enormous resources and potentialities are somewhat difficult to analyse ; but it may be said that, broadly speaking, when railways were first developed, there was comparatively small interchange of products between one district and another, and that the movement of traffic, therefore, was inconsiderable when compared with the great area and teeming population. It has only been as production in certain commodities has been increased by great irrigation works and in other ways that prosperity has been brought to the Indian railways. For example, the expansion of irrigation in the Punjab and in Sind turned the North-Western Railway into one of the greatest grain distributing lines in the world, and brought about a great development throughout the whole of these regions.

The Indian railways fall into four great categories, due chiefly to variations of policy on the part of the government. Without entering upon historical details it is sufficient to state that the first policy was the development of communications by private companies guaranteed by the Government—a policy that was subsequently modified from time to time. The four categories are as follows : railways owned and worked by the State ; railways owned by the State, but worked by private companies ; railways owned by private companies and

worked either by the State or by companies ; and railways which are the property of the semi-sovereign States and worked by them or by private companies. In the first category fall the North-Western, mentioned above, the Eastern Bengal, and the Oude and Rohilkhand State Railway. These three lines return respectively 2.87, 5.00, and 6.20 per cent. on the capital expenditure. Of the railways worked by companies the Bengal and North-Western, paying 8.03 per cent., the Bengal-Nagpur, 6.10 per cent., the Bombay, Baroda, and Central India, 9.05 per cent., the Burma Railway, 6.65 per cent., the East Indian, giving direct access to Calcutta from Northern India, 9.30 per cent., the Great Indian Peninsula, 7.03 per cent., the Madras and South Mahratta, 8.30 per cent., and the South India, 8.03 per cent., are the principal. It may be mentioned that the Government of India exercises certain general powers in respect of all railways in India and has a preponderating interest in nearly all of them ; but in many respects this control is of a co-ordinating character connected with the larger questions of construction and policy rather than of an administrative or directing nature.

In British Malaya, which as yet remains unconnected with India by railways, although the time cannot be far distant when there will be a great through route to Singapore, railway construction has been of such enormous benefit to the country that it may be said that the prosperity of the series of States forming the Federated Malay States and Straits Settlements has been almost entirely due to the extension of railway communications. Previous to the building of the Malay railways the numerous rivers provided the principal means of commerce and communication, and a considerable degree of prosperity had been attained by this means alone ; but the really effective use of the numerous ports of the Peninsula and development of the interior have been due to railway construction coupled with the fine system of roads that is such a feature of the country.

In British Malaya the construction of railways met with few difficulties because the central and mountainous parts of the peninsula have been avoided, and lines have been driven through territory comparatively near to the coast where the country is for the most part flat or only

broken by low hills. The Malayan railways now extend from Singapore in the extreme south to the northern boundaries of the Federated Malay States, where they are joined with the Siamese railways. Railway communication, therefore, is possible with Bangkok, the capital of Siam, over a distance of 1,188 miles. In addition the eastern line has been carried into Pahang and eventually will be constructed through Kelantan to the Siamese borders—thus providing two parallel systems throughout the peninsula; the western line running through Negri Sembilan, Selangor, Perak, Kedah, and Perlis to the boundary of Siam. It is only necessary to mention the rubber and tin industries of Malaya, and the enormous trade of Singapore, which some fifty lines of steamships make a port of call, to demonstrate the great value of the Malayan railways as a means of transport.

Before concluding this section on railways it should be stated that while many parts of the British Empire have benefited enormously from their construction, there are others which, owing to lack of enterprise or want of the necessary Imperial support, have remained practically stationary and whose economic progress has been arrested or retarded owing to the want of efficient means of communication. It is only necessary here to mention British Guiana and British Honduras, both countries of great potential agricultural wealth if only they could be effectively opened by railways. Both these territories, however, require population as well as railways. It is idle to plant expensive lines in a tropical country, without at the same time taking effective steps to secure an adequate supply of labour. For this reason, although it is certain that British Guiana might become a great sugar-producing country, it can only become so if the construction of railways and the immigration of coloured labour are the settled policy both of the Imperial and local governments. It has been stated that 2,000,000 tons of sugar could be exported from British Guiana, but it is certain that this can never be done without a greatly extended population.

CHAPTER III

IRRIGATION AND WATER-POWERS

IN considering the resources of the British Empire, none appears to be of greater importance in the development of production than the inland waters of the various Dominions and Colonies, especially when attention is concentrated upon the future expansion of industrial activity in the Dominions and India, and the continuous diminution in the supplies of coal and oil that must inevitably occur as the demands of industry increase. The inland waters of the British Empire may be regarded from three distinct points of view: their utilisation as a means of transport, their utility for purposes of irrigation, and the part they will play in supplying hydro-electric power for the industrial uses of mankind. It is not possible here to indicate the uses of the inland waterways for the purpose of transport, but it may be stated that the most fruitful avenues for this development exist in Central Africa and in Canada, as has been shown already in Chapter II. It will be well, therefore, to concentrate upon the two other main uses to which the great water resources of the British Empire may be put, to show what has already been achieved, and to indicate briefly possible future developments.

Irrigation for purposes of agricultural production is probably one of the most ancient devices known to mankind for increasing and regulating the product of the soil. In the study of numerous ancient civilisations, no fact becomes more evident than that there were in many cases extensive systems of irrigation by which either the flow of water towards the sea was regulated and the water spread over the adjacent territory, or by which water was stored up for use during the dry season. Without entering into details it may be said that certain civilisations have perished owing to the process of desiccation that has attacked many parts of the world, and that

the same process is at work over numerous large areas, particularly in the middle Sudan bordering upon the Sahara, throughout large districts in Central Africa, where the flow of certain great rivers appears to be less abundant than heretofore, and, more especially, throughout South Africa generally, where within comparatively recent times there has been a decided diminution in the amount of water available for agricultural purposes. Anything, therefore, that can be done to arrest this process of drying-up is a decided gain to humanity, and every effort should be made, nationally and internationally, to study this question and to apply the resources of modern engineering science to the problem, before it is too late to take effective steps to stop an otherwise inevitable process of decay.

Among the nations that may be considered to have perished by the encroachment of desert conditions over lands otherwise fertile, are some of the ancient and almost unknown civilisations of Central Asia, where, as has been demonstrated by modern travellers, particularly Sir Aurel Stein, races of considerable culture appear to have existed in lands that are now entirely desert; and it has been suggested that many of the great migratory movements emanating from Asia have been caused by the increasing desiccation of the countries of high Asia. Similarly, in the drier parts of the western portions of the United States, in Mexico, Peru, and Chile, many evidences have been found of extensive systems of irrigation in regions where agricultural production is now impossible. That irrigation is of high antiquity is sufficiently evident from a study of the irrigation canals of Egypt, Mesopotamia, and other countries; while the antiquity of the actual conservation of water, apart from irrigation from rivers and canals, is demonstrated by the celebrated Tanks, which are one of the principal sights of Aden, and by the numerous tanks and wells which form so important a feature in the agricultural system of ancient India.

In many parts of the East, and especially in India, irrigation is a necessity of existence and a great part of the prosperity of modern India is due not only to the activities of past generations of irrigators, but more especially to the enormous irrigation works that have been

undertaken since the British assumed control. Without considering the problems involved in the diversion of ancient waterways into new channels and the geological processes that are continuously taking place owing to the so-called head-water erosion, caused by rivers eating their way back beyond their original water-sheds and thus carving out for themselves new channels during the course of the ages—a process that can best be studied perhaps in connection with certain rivers of Africa, notably the Niger, the Congo, and certain South African rivers—it is not possible to view the question in all its bearings. Attention must be directed, therefore, more particularly, to present conditions and the means that have been adopted to supply the necessary moisture to growing crops. In India, where irrigation has worked remarkable changes, there are large tracts, such as the deserts of Sind and the south-west Punjab, which are practically rainless; there are others, such as the Deccan plateau, where cultivation is precarious, owing to the irregularity of the rainfall and the long intervals during which the crops may be exposed to a blazing sun and a desiccating wind without receiving the stimulus of waters, while there are certain crops, like rice and sugar-cane, which, as a general rule, can only be matured by the aid of irrigation. In addition, there are areas where the first crop, the *kharif* or rain crop, can be raised in normal years by the unassisted rainfall, but where the second crop, the *rabi* or cold weather crop, is largely dependent upon irrigation. Of the total area of the British provinces in India only a little more than one-third (about 223 million acres), is cultivated and sown annually; while little more than one-fifth of the cultivated area is dependent upon irrigation. For the remaining four-fifths, if the rainfall be deficient the crops fail and the population suffers distress, while a succession of two or more seasons of drought results in a local famine; India, as are most lands of the East, being a country dependent upon local supplies of food, and in which a failure of crops, unless prompt organisation or relief be applied, means untold misery and death to countless thousands of people. India, therefore, is pre-eminently a country where the advantages of irrigation can be studied and where irrigation has produced the greatest good in adding to

the local population and steadying the agricultural output.

The irrigation works of India may be divided into three main heads—wells, tanks, and canals. The first are of every description, and the means of raising the water vary in equal degree from the Persian wheel, which is an endless chain of earthenware pots running round a wheel and distributing the water in much the same manner as dredgers empty their contents, to mechanical power furnished by oil engines. In addition tanks for the storage of water are a conspicuous feature of almost every Indian village and perform a useful service in agriculture ; while the great storage tanks and reservoirs, such as Lake Fife and Lake Whiting in the Bombay Presidency and the Periyar Lake in Travancore, are of great use in increasing and stimulating agricultural production. It is, however, the great irrigation canals of India, which have had so profound an effect upon Indian agriculture, and these vary from the inundation canals, that are above the normal level of the river, and are fed by the flood waters, which were constructed by the Mohammedan and Sikh rulers, to the great engineering works that have been undertaken under British auspices.

The present irrigation policy of the Indian Government is founded in the main upon the conclusions of an important commission that was appointed in 1901, by Lord Curzon, and issued an exhaustive report upon the subject. This may be regarded as the charter of modern agricultural production in India ; and the conclusions of the commission afford abundant evidence of the importance of irrigation as a means of stimulating and increasing agricultural production. It is estimated that at the present time, excluding the irrigated regions in the semi-sovereign States, the total irrigated areas amount to just over 25 million acres, or about 39,063 square miles, an area about four-fifths the size of England, which depends almost entirely upon irrigation for its fertility.

There are numerous large irrigation canals in India, but mention should be made of the great Ganges canal, constructed by Sir Probyn Cautley, which in magnitude has not been surpassed by any irrigation work in India or elsewhere ; and the Chenab canal, another immense work which irrigates nearly two million acres, or a district

equal to nearly two-fifths of the fertile area of Egypt. Both the Chenab and the Jhelum canal, another important work, have brought under cultivation great areas of waste land, and have been instrumental in facilitating the system of state colonisation which relieved some of the congestion in the villages of the Punjab, and opened for agriculture vast new districts. In this connection the canal colonies of the Punjab are worth study since they form an illustration of the importance of irrigation for settlement in districts which were before almost uninhabitable. Many such districts now exist in India and the national production has been greatly benefited by the means that have been adopted for bringing water to parched lands. While Sind, the Punjab, and the North-West Frontier districts have been immensely helped by these irrigation canals, it is in Madras that there was constructed the boldest and most imaginative irrigation work in the world—the great reservoir at Periyar which was built on the outer slopes of the Ghats, the water being led through an intervening hill by means of a great tunnel. It is sufficiently evident without labouring this point further that irrigation in India plays a great part in the national economy. Without comparing the desolate wastes of Sind with the fruitful Punjab, it is difficult to realise the benefit derived from similar land under efficient cultivation. A great irrigation scheme authorised by the Indian Government at an estimated cost of £12,300,000—the Sukkur Barrage Irrigation project across the River Indus—which is estimated to irrigate an area of 5,300,000 acres, a region more than the total cultivable area of Upper and Lower Egypt, and more than double the area irrigated by the Lower Chenab canal, will effect a great change in Sind and add enormously to the lands capable of producing cotton.

With respect to other parts of the Empire, South Africa and Australia afford the most striking object lessons of the value and possibilities of the storage of water for irrigation. In South Africa immense quantities of water run to waste annually to the seas, or are lost in the long stretches of arid country intervening between the headwaters of the rivers and the ocean. This is particularly the case with regard to the Orange River, where great quantities of water are lost by evaporation

without rendering any effective service to the surrounding country. In South Africa the problem is complicated by the extensive climatic, or at any rate hydrographic, changes that have taken place during the last century. Professor Schwarz has demonstrated conclusively, we think, that such changes have occurred and are still taking place, and the solution suggested by him—the diversion of water from the Cunene and the Okavango rivers towards the depression of the Kalahari, where water was much more plentiful within historical times—seems to be a practical reversal of natural processes which have robbed this immense region of its former fertility. It is one, at any rate, that will have to be studied with the greatest attention by the present generation if the process of desiccation in this great area is to be arrested. It is not possible to enter into a discussion of the reasons for the diversion from South Africa of the water which used to flow into these regions, and it can only be said here that Professor Schwarz after careful and prolonged study has come to the conclusion that this diversion has been caused by head-water erosion mentioned above.

It is estimated that at the present time some 817,000 acres are under irrigation in the Union of South Africa. This is, of course, but a small proportion even of the total area at present under cultivation (13 million acres), but it represents an addition to the national resources of some importance. In South Africa the problem of irrigation is one of great difficulty, owing to the fact that in the coastal district where the rainfall is most plentiful it is not possible to make the surplus water available for irrigating the higher plateau where the rainfall is insufficient; nor are any natural reservoirs provided by snow-clad mountain ranges. Nevertheless it has been estimated by so competent an authority as Sir William Willcocks that some 3,000,000 acres, two-thirds of which are in regions suited to European labour, could be brought under irrigation for an expenditure of £30,000,000, and although later reports have been of a more cautious character, it is undoubted that great tracts exist where production could be stimulated by means of irrigation canals and dams. Moreover, it is by no means uncertain that much might not be achieved by means of artesian wells, as has been done in Australia, and experiments

have been undertaken with this end in view over a series of years. An example of a great irrigation dam is afforded by Van Wyk's Vley in the Carnarvon district of the Cape Province, with an area of nineteen square miles and an average depth of ten feet, but the catchment area is insufficient to fill the lake, which is occasionally quite dry, evaporation accounting for a great loss of water just when it is most urgently needed. Two great dams have been built across the Vaal River near Vereeniging. The first holds the water back for eight miles and irrigates large tracts of land: the second, constructed by the Rand Water Board, holds back the water for 42 miles. Other recent schemes are the Hartesbeestpoort irrigation works in the Transvaal, the Lake Mentz (Sundays River) works, the Tarka (Great Fish River) scheme, the Upper Modder works in the Orange Free State, and the Grass Ridge works near Cradock. The total amount to be spent on these works is about £4,700,000. The problem of South African irrigation as a whole, with reference to the conflicting requirements of agriculture, mining, industry, and purely local use, has not yet been tackled in its entirety, and in any case, whatever may be the ultimate steps taken to secure a comprehensive and effective conservation of water, it is undoubted that the problem of irrigation is one of the most pressing in the sub-continent whose future prosperity will depend in large measure upon the solution of the questions connected with the progressive desiccation of large parts of the country.

In Australia the problem of irrigation is deeply concerned with the whole question of closer settlement, and a great policy of water conservation and irrigation works has been initiated and to a large extent carried through. Only a small proportion of the total area of the continent receives an adequate and regular rainfall, but there is in addition to these favoured regions a considerable extent of land where all the factors exist that are requisite for success in agricultural pursuits excepting only a constant supply of water. Over large areas in Queensland, New South Wales, and the north-eastern part of South Australia, much has been done by means of artesian wells, and this area is known as the Great Australian Artesian Basin. In Western Australia there are other artesian

areas and similar basins exist in the Murray River area. The permanence or otherwise of this great series of artesian bores is, however, a source of fruitful controversy, one set of authorities maintaining that the waters are drawn from a great underground supply, which in the course of time will become exhausted, and other authorities asserting that the waters are continuously fed by the rivers which lose themselves in the interior deserts of Australia, and spread themselves over enormous areas in times of flood before sinking into the soil. In any case, artesian boring has worked a wonderful change in many parts of the continent, and has added greatly to the local production. Much has also been done by barriers and reservoirs. The Murrumbidgee irrigation scheme, including the great dam at Burrinjuck where the water will be impounded into a lake of 12,740 acres, is designed to open a great and fruitful region for closer settlement, while various other smaller schemes have already worked a great change in this part of Australia. In Victoria the Goulburn river scheme is the largest irrigation enterprise, irrigating as it does some 868,000 acres in that State, while there is a large number of irrigated areas in this and other States—the best known of which are perhaps the Renmark and Mildura regions, where fruit-growing has made such marked progress. With regard to the waters of the Murray, a great scheme of irrigation works is under construction, involving also the locking of the river for purposes of navigation; and the whole question of irrigation in Australia has been tackled with energy and foresight, which reflect the greatest credit on the national will to render the less favoured portions of the continent capable of a high degree of cultivation.

So far our attention has been directed to irrigation with its manifold possibilities for increasing national production. But there is another equally important use of water—the distribution and use of hydro-electric power throughout the empire. To describe this means of increasing production the word water-power has been devised, and it fits exactly the uses to which the inland waters of the empire may be put. During recent years the value of this potential source of energy has been more and more realised, and with the constant demands upon the strictly limited supplies of coal and liquid fuel it is

evident that the time must come when these will be reduced in quantity and consequently become dearer, so that their industrial uses will be curtailed and other sources of energy will have to take 'their' place. In harnessing the forces of nature it is possible that in the future science will be able to utilise the rise and fall of the tides, to catch and confine the forces of solar energy, or to use still other powers that as yet are unknown. But so far as we can see at present there is one great source of energy that will have to be utilised, and is now being used to a considerable extent—the energy supplied by waterfalls and rapids. It is evident that so far as the British Empire is concerned we are in a particularly fortunate position in this respect, as there are enormous supplies of energy, especially in Canada, India, New Zealand, and Africa, which can be harnessed and used for the service of mankind. Without an ample supply of cheap energy much of the mineral and agricultural wealth of the empire must remain dormant and unused: with it great changes will be brought about and regions that are now sparsely populated will become centres of thriving industry.

With regard to the water-powers of the British Empire, it is evident that this source of energy is eminently one for State control. Private bodies and corporations, as such, while serving the needs of the community, cannot be allowed to control the natural resources that are the property of all, and for this reason legislation has been passed in many countries regulating the use of water, especially in connection with the provision of hydro-electric energy. In the case of Canada and New Zealand the State has assumed control over the majority of the water-powers; and in India the Government has full powers over all rivers and streams flowing in natural channels. In Australia, however, little has been done to ensure by legislation the control of developable water-power, but investigations are being made into the possibilities of power development, and hydro-electric departments have been created in some of the States. But up to the present there has been no systematic survey of the water resources of the empire, although one of the suggestions of the Water-Power Committee, under the Chairmanship of Sir Dugald Clerk, which issued

its final report in 1921, is that a close systematic investigation should be made of all water-powers throughout the empire, and of their economic possibilities, and that an Imperial Water-Power Board should be constituted in order to secure co-operation between the different Dominions and Colonies and to act as a clearing-house of information on this subject for the whole empire. The appointment of this committee was, of course, a recognition of the great importance of this question, and its report forms a document of considerable value as a preliminary survey of the water resources of the British Empire.

Estimates of the world's demand for power naturally vary greatly, but it is assumed that the present demand is for 120 million horse-power, which includes all steam, gas, and water-power. Some 75 million horse-power is used for the world's factories, including electric lighting and street railways, and of this amount some 13 millions are utilised in the United Kingdom and 6 millions in the rest of the empire. It is evident, therefore, that the present demand is large, but it is also clear that it will considerably increase in the future. With regard to water-power the main sources of energy are to be looked for in Canada, India, Papua, and New Zealand, where there is a roughly estimated available power of 40 millions. In addition, there are the water resources of Africa, Ceylon, Australia, British Guiana, and the Malay States, so that in the aggregate our resources are enormous. Moreover, with the exception of Canada, with an estimated available power of nearly 23 millions,¹ of which about one-seventh is at present utilised, they are barely tapped, and one of the great problems of the future is to render these potential reserves of energy useful for the service of mankind.

As the greatest development has taken place in Canada, where there is also the largest amount of potential energy, some attention must be devoted to the water-powers of the Dominion. The history of water-power development in Canada has been one of steady progress,

¹ In "Canada as a field for British branch industries, 1922," the water-power resources of the Dominion are estimated at 18,255,000 horse-power at ordinary minimum flow, and 32,075,000 at estimated flow from maximum development, dependable for six months. The present turbine installation is stated to be 2,470,000 horse-power.

and the industry has been a stable one. Whether times have been good or bad the output has been steadily growing, and in 1922 it was shown that the total water-power installation had grown to approximately 3 million horse-power, of which some 240,000 were installed during that year. This new creative energy is developed chiefly in Ontario and Quebec, and is frequently distributed over long distances, but there is also considerable development in British Columbia and in a lesser degree in Manitoba and the eastern Maritime Provinces. Of the total amount of power, fully two-thirds is developed in central Ontario, which supplies public and private buyers, about one-sixth is used in the pulp and paper mills, and the rest is employed in other local industries; the two latter classes being exclusive of the energy distributed to them from the central stations. Canada actually exports energy to the United States and receives energy from that country, but in the transactions involved she is an actual loser of some 64,000 horse-power.

During a series of years close observation has been kept on the flow of streams in Canada, and accurate measurements have been taken, and the whole movement has been organised by the Dominion Water-Power Branch and co-ordination of effort assured by Inter-provincial Conferences held under the auspices of the central body. In the province of Ontario the industry is under the control of the Hydro-Electric Power Commission, which inaugurated its work in 1910 at Berlin (now Kitchener), by supplying electric energy generated by the Niagara Falls to fifteen neighbouring municipalities. Subsequently operations were rapidly extended, and by 1919 over 143 municipalities in Ontario derived their electric energy from the water-power schemes of the commission. In fact, it may be stated that practically all industrial centres of the Dominion are supplied with electrical energy derived from water-power, with ample reserves located within easy transmission distance. The possibilities of water-power, however, even in Ontario, are not inexhaustible, and it has been pointed out that the climate of the greater part of the country is so severe in the winter, that even the immense potentialities of its water-power, if fully developed, would be inadequate to cope with the demand for power for electric heating should there be

a great call for this form of energy. For this reason attention is devoted more especially to the distribution of power for industrial uses, railways and tramways, and other similar purposes, more in keeping with the movement for increasing the actual industrial production of the country. The Ontario Hydro-Electric Commission as a body is not subject to ordinary political control, but has a constitution which removes it, or should remove it, beyond the range of political influences. In addition to these bodies there is the Commission of Conservation for the whole of the Dominion, mentioned on p. 17, which is advisory in functions and status, but has performed a notable service in connection with water-power, among other matters. It is interesting to notice that the Commission estimates that of the 3,730,000 square miles of the Dominion it may be expected that some 2,000,000 will be fairly thickly settled within the next few decades.

With regard to the actual water-powers of Canada in addition to those utilised, it is stated that on the Winnipeg River there is almost as much power available as is now in use at Niagara ; that the Saguenay River in Quebec alone offers three power sites with a total capacity of one million horse-power ; that the Nelson River in Manitoba has four million horse-power available for eight months in the year ; that the Shawinigan Falls on the St. Maurice River, about eighty miles east of Montreal, have considerable power in use and in reserve ; and that the St. Lawrence River has enormous resources available for both Canada and the United States. Under treaty arrangements the surplus power generated and not needed in Canada may be exported across the boundary. In British Columbia there are also large power resources in connection with the rivers flowing from the Rocky Mountains to the Pacific and considerable development has taken place, particularly with regard to the pulp and paper industry. It is computed that there are 113 pulp and paper mills in the Dominion operating by water-power. In this industry especially the value of cheap energy is enormous, as it is estimated that it takes practically 100 horse-power to produce one ton of paper a day. The use of energy in this industry, is therefore, almost exclusively restricted to hydraulic power. In

conclusion, so far as Canada is concerned, it may be noted that the investment of capital in hydro-electric plant represents nearly £124,000,000 and that the present development is the equivalent of 26,700,000 tons of coal—a saving in the consumption of the coal resources of the world that is of considerable importance. In the old Colony and now Dominion of Newfoundland no estimate has been made of the water-power resources, but about 54,000 horse-power has been developed for use in the paper mills and a much smaller amount for other industrial and general purposes.

In India during and since the war the question of developing the water-power resources has received a good deal of attention and, acting on the recommendation of the Indian Industrial Commission of 1916, engineers were appointed to report upon the matter and a survey was undertaken. This survey is now taking place, and the two reports that have already been issued have disclosed the existence of about 130 possible water-power sites. Although it is stated that there is a total of 1,774,000 continuous electric horse-power in sight, this amount is vastly below the final results that the survey will disclose. Many millions of horse-power will certainly be obtained from the Himalayan Mountains and the great rivers of Burma, in addition to the available power from such rivers as the Ganges, the Bramaputra, and the Indus. The greater part of these tremendous resources, however, will remain unused until engineers develop means of transmitting energy up to distances as great as 500 and 1000 miles—a not improbable advance in view of the great developments that have already taken place in the transmission of power. The present use of hydro-electric power in India is not extensive, but mention may be made of the Tata Hydro-Electric Company, with a present horse-power development of 50,000, and the Tata Power Company now developing 75,000 horse-power, with a possible 150,000 in view. The Tata schemes, of which there are four, those mentioned above and the Andhra Valley and Koyna River projects, will supply Bombay and its neighbourhood with 915,000 horse-power, and the importance of these and other works in a country like India, where there is an abundance of cheap labour, can be readily understood in connection with the

future industrial development of the country. So far as Bombay is concerned nearly half the spinning and weaving of cotton is concentrated in the city, and it is obvious that there will be a great extension of these industries with increased electrical power. The size of India is too immense for me to deal in any way with the numerous sites and schemes for water-power, but it is easy to understand the enormous influence upon the productive capacity of the country, which the extension of hydro-electric energy will bring about.

The water-power resources of other parts of the Empire can only be described briefly. In Australia, for example, though there has been no notable development and the aggregate of possible power is small, there are certain districts where it might be developed, notably in the Australian Alps, situated partly in Victoria and partly in New South Wales, in the Blue Mountains, west of Sydney, in the New England Range in New South Wales, and in the Cairns district in Queensland. In all, according to recent rough estimates, it is computed that about 1,000,000 horse-power is available in the continent, with an additional 400,000 in Tasmania, where the conditions for hydro-electric energy are much more favourable than on the mainland. In Papua considerable powers are available, and it is stated that "the accumulation of energy in a country approximately the size of the British Isles would appear to afford the means at some future date, of opening up industries demanding large blocks of cheap power, on a scale hitherto undreamed of in the Southern Hemisphere." This development must be a matter of the distant future.

In the case of New Zealand, however, there are very large water-powers, estimated at 3,822,000 horse-power, of which 3,200,000 are in the South Island, and certain schemes are already being developed. The presence of this potential energy is a matter of great importance for the Dominion, especially in connection with electro-chemical and electro-metallurgical activity; and it has been stated by Mr. Hancock, who has reported on the subject, that, with regard to the manufacture of nitrogen products, aluminium, calcium carbide, and the like, "the manufacturing of all Australasia and a great portion of the Orient could be done here better and cheaper than

anywhere else. Being so near these markets, with this unlimited power, and having a climate suited to a degree to manufacturing purposes, the possibilities of the colony are almost beyond the bounds of fancy."

In South Africa a systematic survey of water-powers has been undertaken, but here, owing to the seasonal character of the rainfall, the flow of the rivers is greatly diminished or entirely ceases, and their value as sources of power is consequently lessened. Nevertheless, there is a number of power resources on the Vaal and Orange Rivers, in Natal, and in the Transvaal. The great Howick Falls in Natal and the Aughrabies Falls on the Orange River are great sources of energy, the latter, however, too far away from centres of population to be of any present effective use. On the Rand the great source of power is coal. Farther north in Rhodesia, the Victoria Falls, the Kariba Gorge on the Zambesi, and certain rivers tributary to the Zambesi, as well as the Sabi River, seem to offer a possible 220,000 horse-power; but the amount is small compared with the future needs of the country. In Kenya there are considerable water resources, but there is a lack of definite data with regard to their extent and capacity, and the same remark applies to Tanganyika, where there are certain falls of some value on the coastal rivers. In Uganda, on the other hand, the resources of the falls on the Nile, such as the Ripon Falls and Murchison Rapids; the Semliki River between Lakes Edward and Albert, and other rivers, are large; and the possible transmission of energy from the Ripon Falls to the settled districts of Kenya and for the purpose of the cotton industry in Uganda has been much discussed. In any case steps have been taken to control the exploitation of these reserves of power. On the opposite side of the continent West Africa offers certain resources, particularly the Gold Coast, with its coastal rivers; but no survey or estimate of these resources has been made. The Niger itself between Jebba and Lokoja in Northern Nigeria is stated to be capable of generating 150,000 horse-power. The only other important source of power, apart from the numerous rivers of British Malaya, is to be found in the great Kaieteur Falls in British Guiana, which have a total drop of 1000 feet, and on the Essequibo, Mazuruni, and Cayuni Rivers; as well as numerous

falls in the interior of the colony about which very little is known. There is no doubt that there is a great store of energy in British Guiana, just as there is in British Honduras, where the Vaca Falls are about 700 feet high ; and its use in the future is certain to be instrumental in developing the country.

To sum up the position with regard to the relative values of these sources of electric energy, it should be emphasised that while the solid and liquid fuels such as coal and petroleum are easy to handle, and may be transported by rail to any locality in which their use can be undertaken economically, they are strictly limited, and the squandering of the natural resources of the world, so apparent in many directions, is reducing year by year the available supplies of energy-producing materials. Although public opinion has in some measure been awakened to the importance of conservation, and much of the residual waste which in former years was recklessly cast aside is now used for many different purposes, there is still a prodigious destruction of sources of power for which posterity will have to pay an increasingly heavy price. In view of this eating up of the vitals of industrial energy it is of the greatest importance that the water resources of the empire should be studied and thoroughly understood, and measures taken wherever possible to secure the permanence of natural supplies.

In this respect rainfall is of paramount importance and wherever it is lessening steps should be taken to study the factors that appear to be contributing to such natural disasters as, for example, the drying-up of the Kalahari desert. The depletion of forests, as pointed out elsewhere, is an important factor in connection with the diminution of rainfall ; and not until the whole subject of climate and rainfall in all their bearings is studied by scientific men, and their suggestions acted upon, will the conservation of water, so vitally necessary to mankind, be put upon a satisfactory basis. Water provides, at present, our only perennial source of power, and the British Empire cannot afford to waste this energy, or, in the future, to allow it to run to waste without utilising it, wherever possible, for industrial purposes. The economic development of many of our tropical possessions, with enormous latent wealth that is at present almost unused

and capacities for increased production in many commodities, is deeply concerned with the harnessing of water. As reported by Sir Dugald Clerk "not only would an abundant supply of cheap power enable railroads to be operated, irrigation schemes to be developed, and mineral deposits to be tapped and worked, but it would go far to solve the labour problem which promises to be of some difficulty in the near future." Labour and industrial power must necessarily go hand in hand and in this respect every move for increasing the labour resources of our tropical colonies and overseas dominions must be accompanied by efforts to secure the necessary energy which will enable this labour to be turned to the best account. The harnessing of electric power, can perhaps be studied best in northern Italy where (in the whole country), some 1,250,000 horse-power has been developed in the streams coming from the Alps and Apennines, and where electrical invention has reached its highest development. Similarly in the mountainous regions of France a great advance has been made in the utilisation of hydro-electric energy. These lessons must be applied to all parts of the British Empire—although at the present time with regard to the utilisation of hydro-electric power one is, fortunately, preaching to the converted.

A very important aspect of this question is the production of nitrates for use in agriculture. It is estimated that the world's annual consumption of nitrogen in its various forms is about 750,000 tons, and the demand is increasing yearly. In view of the rapid depletion of natural deposits the production of artificial fertilisers is of the highest importance and these can be produced most cheaply by the utilisation of the available electric energy. Some 6,000,000 tons of fertilisers are stated to be consumed annually. In the nitric acid industry great development has taken place in Norway, where nitrogen is obtained from the air, but this process involves the consumption of energy on a large scale, and the production of many kinds of fertilisers must necessarily be dependent upon abundant resources of energy.

CHAPTER IV

IMPORTS INTO GREAT BRITAIN

ONE of the most important results of the war was to bring home effectively and grimly to the people of the United Kingdom—the centre and pivot and centrifugal force of the British Empire— their dependence upon outside sources of supply not only for their very existence as human beings but also for the prosperity and continuance of their manufacturing industries. At no time in the long history of Great Britain was the logic of events so irresistibly persuasive as during the period from 1914 to 1918, when only the sea power of the British Empire prevented the collapse and probably the conquest of the mother country, and the utter undoing of the centuries of patient and unwearying enterprise, by which the great system of States comprising the British Commonwealth of Nations has been developed into a political and economic entity. There were periods during the war, when it appeared as though the fabric of the State might collapse under the increasing strain of unrestricted submarine warfare whereby the great avenues of maritime commerce, bearing their supplies of the products of the earth to the central and most dependent market, were placed under unceasing toll by those who realised that the vital area of attack upon a country relying on overseas sources of supply was the ocean. It is not necessary, therefore, to emphasise again what was so decisively proved during the progress of the war—the paramount importance of the protection of sea routes—but rather to concentrate our attention on another important factor in the national life, the dependence of the nervous centre of the British Empire upon overseas sources of supply and the possibility of rendering the British Empire self and mutually-supporting in the economic sphere. It is assumed, of course, that the routes of commerce must

and shall be protected—otherwise a self-supporting empire can only be a delusion and a snare, inviting attack from any quarter strong enough to overthrow a system by which it might conceivably regard itself aggrieved.

The question of a self-supporting empire has been discussed from many angles of view, and there are not wanting those who look upon such a system as a positive danger should it ever be brought about, inasmuch as it must necessarily tend to invite a coalition by outside powers against what would become the dominating economic and political force of the world, capable of controlling, if it desired, the great sources of tropical supplies and diverting them to its own particular uses. It is quite certain that the British Empire, although it may be self-supporting, can never become a self-contained, that is an exclusive, commercial and economic entity. If it is to exist it must have access to the great markets of the world, and other nations must have access to the wealth of raw materials and food products which it contains. There is not room on the globe for two economic worlds, one inside and one outside the British Empire, and any attempt to bring this about on purely selfish economic issues would be doomed to failure.

With such a proposal we are not concerned in the present volume, but we are concerned with attempts to make the British Empire independent of outside sources of supply whenever, as in times of war, it is necessary for it to become so, and to obtain from its immense resources so much of the food products and raw materials of commerce as can be so supplied without creating an exclusive economic community within the four corners of the empire. We shall examine, therefore, briefly, how far the United Kingdom, as the most important consuming area of the empire, is dependent upon foreign sources of supply for its vital economic needs, without considering the larger economic and political problem involved in extending inter-imperial trade at the expense of foreign commerce. We shall assume that it is a good thing to increase the production of the empire in every way possible, but we shall not consider how far it is

good to bring the greater part of that produce to the United Kingdom, as we believe that foreign trade is as essential as Overseas trade and that there are, therefore, bounds to the amount of raw materials and food products that can be exchanged between the component parts of the empire. What these bounds may be it is not possible or desirable even to indicate.

At the opening of the war the United Kingdom and the rest of the British Empire were practically dependent upon foreign sources of supply for some most important products vitally necessary to the economic welfare of the community. That was a position of affairs which cannot be justified in any conception of a free and independent congeries of States, as it is evident that to be wholly dependent upon foreign sources for certain essential products constitutes a serious flaw in the economic stability of a great empire in the event of such supplies being removed entirely from its markets. Amongst articles mainly or wholly produced and controlled outside the British Empire are six very important products to which attention will be devoted in subsequent chapters. These are cotton, tobacco, petroleum, nitrates, potash, and, in the food-products, maize, though in each of these cases, with the exception of nitrates, much is and will be produced within the empire. In addition, certain rare minerals having important economic uses were controlled outside the empire previous to the war, although produced in larger or smaller quantities within it, such, for example, as thorium obtained from deposits in Travancore, and sold to a German company, and tungsten which was also mainly controlled in Germany. It is evident that sound economics could not permit the continuance of such a system and steps were immediately taken to end or minimise the evil.

Looking at the subject more particularly from the point of view of the United Kingdom, it will be well to examine the position first with regard to the food-supply, secondly the supply of raw materials, and thirdly, the mineral products, and then in later chapters to describe these materials more in detail. For the purposes we have in view it is necessary to compare pre-war

consumption, wherever possible, with that of the present day, because considerable changes have taken place, both in the areas of production and the distribution of the products, and in many respects we have not returned as yet to normal conditions. The pre-war figures are, therefore, of very great value as an indication of the normal flow of trade, although present returns are of equal value as indicating what must be regarded as a substantial and permanent advance in the amount of products received from within the empire.

As the United Kingdom is peculiarly and increasingly dependent upon outside supplies of food, owing to the neglect of really effective means of supporting the agricultural industry in Great Britain, whether by a reform of the land laws, by control of railway freights, by utilising canal traffic, or by direct marketing of agricultural produce and the elimination of the middleman; our preliminary survey may be commenced with the grain and flour which happen to be the most important class of food-products imported into this country. The total imports of grain and flour of all kinds during the year 1913 were valued at £84,000,000, and of this quantity £54,000,000 worth came from foreign countries, and £29,000,000 from British possessions. In the year 1921, these amounts had increased to £138,000,000, and the supplies from foreign countries and British possessions to £79,000,000 and £58,000,000 respectively. In other words the percentage imported from the Dominions had increased from thirty-five to forty-two. The elimination of Russia as a wheat-exporting country and the uncertainty with regard to supplies from India, the Argentine, and, to a very much less extent, from Australia, has led to an increased reliance upon Canadian supplies; so that the greater amount comes from Canada either direct or through the United States, Australia coming second, the Argentine third and India fourth, though there are extreme fluctuations in the Argentine supply, which was thirty million hundredweights in 1920, and only four million hundredweights in 1921. In any case, it is evident that supplies from within the British Empire show a large increase and that Great Britain should soon be completely independent of outside sources,

the percentage in reality being greater than that quoted above owing to the fact that in the official figures a proportion of the Canadian wheat supply is counted as coming from the United States though its origin is Canada.

With regard to exports from Canada it is impossible to arrive at a correct estimate of the totals received in this country, owing to several factors that modify the figures as recorded in the Board of Trade returns. In the first place harmony between the two sets of returns, those of the United Kingdom and of Canada, cannot be achieved owing to the fact that the British returns are for the calendar year, and the detailed Canadian returns are for the fiscal year ended on March 31st, in each period, and that a considerable part of the Canadian export trade, particularly in bulky articles like grain, is carried through American ports and is, presumably, set down as from the United States, even though it consist of Canadian produce (see also p. 98). Moreover, another considerable and disturbing factor of which no account is taken in the official figures is that during the course of transit across the Atlantic, goods quite commonly change ownership or, even without change of ownership, are diverted from their intended destinations to other places of discharge. Thus the quantity of canned beef shown as received from the United States in 1921, was three times the amount shown as despatched to this country from the United States—great quantities originally intended for continental ports, and so shown in the American returns, having been diverted to the United Kingdom *en route*. In the case of grain and flour such diversions are very common and have the effect of rendering it impossible to check from the records of the countries of sale (not necessarily the countries of origin), the accuracy of the attribution of goods in the countries of purchase. Similarly a comparison of figures suggests that in 1921 nearly 6,000,000 hundredweights of maize recorded in the United Kingdom as consigned from Canada were in reality of United States origin. In the case of flour, again, the fact that our receipts show 1,000,000 hundredweights more from the United States and 2,000,000 hundredweights less from Canada than correspond to the records of despatches from those countries does not necessarily mean that any Canadian

flour was misdescribed as of United States origin, but may be sufficiently explained by diversions of Canadian flour to the Continent and of United States flour from the Continent.

The figures of wheat during 1921 indicate that about two-thirds of the Canadian wheat originally shipped to the United Kingdom must have been diverted to other destinations. It is possible that, at the time of the original despatch, the intention of the shippers was that the vessel in which such wheat was transported should call at Falmouth or some other British port for orders, and that, in the actual event, these orders were for discharge elsewhere than in the United Kingdom.

While it is true that Canadian products shipped from United States ports may change ownership in the United States, and be reconsigned in such a manner as to appear in the United States records as consigned from that country, it is also true that United States products, shipped via the St. Lawrence, are in some cases reconsigned in Canada so as to appear in our import returns as consigned from the latter country. The prevalence of changing the destination of cereals, and flour in particular, while ships are on the water, necessarily limits the evidence on the subject of sources of imports to the records of the importing countries, and the practice of giving countries of export rather than countries of origin, also tends to modify any proportionate figures of actual origin that may be worked out. The latter point may be illustrated by one example taken from Africa. In the case of copper, £1,511,000 worth is shown as imported from Portuguese East Africa in 1919. Practically the whole of this copper comes either from the Belgian province of Katanga, or the Bwana M'kubwa and Kafue mines in Northern Rhodesia, via the port of Beira, or from the northern Transvaal, via Delagoa Bay; yet in the actual Board of Trade figures, these large amounts appear as coming from Portuguese territory. The figures quoted below (kindly supplied by the Board of Trade), show the position in 1921 with regard to certain commodities from Canada and the United States respectively, the imports into the United Kingdom being the British returns, the exports to

the United Kingdom being based on the locally recorded figures.¹

With respect to other cereals than wheat, imported barley mainly comes from Canada, oats from the Argentine, and maize chiefly from the Argentine, the United States, Rumania, South Africa, and Canada (mainly as an exporting and not as a producing country). The two last countries in particular show very large increases, but the principal supply is still drawn from outside the empire, particularly from the Argentine. Rice comes chiefly from India and Siam, tapioca from Java and the Straits Settlements, and sago almost exclusively from the Straits Settlements.

The United Kingdom imports vast quantities of meat, fresh, tinned, salted, chilled, and frozen, the total in 1920 being over 1,160,000 tons, valued at £135,000,000. Of this enormous amount the percentages of foreign and overseas imports before and during the war remain practically the same; that is, 75 per cent. from foreign countries, and only 25 per cent. from within the British Empire. This is, of course, a very unsatisfactory state of

Commodity.	¹ Imports to the U.K. during 1921 consigned from		Exports to the U.K. during 1921 consigned from	
	Canada	U.S.	Canada	U.S.
	Cwts.	Cwts.	Cwts.	Cwts.
Wheat	14,580,320	36,065,002	46,759,556	34,110,028
Barley	3,119,200	8,587,000	3,915,953	7,745,756
Maize	5,780,200	6,733,600	948	7,905,525
Wheat flour and meal	5,866,019	7,900,742	8,054,086	6,995,959
Beef, fresh, frozen or chilled	44,831	34,269	50,261	19,010
Beef, canned	6,607	100,880	(1)	33,596
Bacon	844,024	2,500,379	908,267	1,871,000
Hams	93,906	1,020,718	{	1,734,241 (2)
Total bacon and hams	937,930	3,530,097	908,267	3,605,241
Apples, green or ripe	1,494,052	1,712,822	1,300,577 (3) Barrels	1,498,839 (4) Barrels

(1) Included with "Canned meats" in Canadian returns.

(2) Hams and shoulders.

(3 and 4) The amounts in the Canadian and United States returns are given in barrels. It will be seen that the two sets of figures (the British in cwts. and the Canadian and American in barrels) closely approximate.

affairs in view of the immense pastoral resources of the Dominions ; but it is impossible to arrive at an exact estimate of the amount imported from within the British Empire owing to the fact that the origin of supplies is not stated in the case of those coming from the United States, and the figures are therefore to a certain extent misleading. Taking the recorded figures at their face value it appears that beef comes chiefly from the Argentine, Australia, and New Zealand ; tinned meats from the United States, Argentine, Australia, and New Zealand ; frozen mutton and lamb chiefly from New Zealand and Australia, with considerable quantities from the Argentine, United States, Chile, and Uruguay ; bacon chiefly from the United States, Canada, and Denmark ; and ham from the United States and Canada.

The products of the dairy received from within the British Empire have increased very largely within recent years. In the case of butter the percentage has increased from nineteen to forty-nine, and in the case of cheese from eighty-two to ninety-three. The first largely comes from Denmark, Holland, and the Argentine, though large quantities of Australian and New Zealand butter are now marketed and smaller quantities come from Canada. The large supplies that used to come from Russia have almost entirely ceased. Eggs which were imported from Russia in their millions, over eleven million great hundreds having been consumed in Great Britain in 1913, now come mainly from Denmark, with smaller quantities from China, Egypt, Morocco, the Argentine, United States, Latvia, and Holland. Canada is now sending a considerable quantity but only 15 per cent. come from within the British Empire.

The enormous growth in the fruit trade during recent years has been marked by an increase in the imports from within the British Empire, the amounts imported from within the empire having increased from 13 to 20 per cent. ; but the position is still unsatisfactory in view of the great potentialities of South Africa, Australia, New Zealand, and many other parts of the empire as fruit-producing countries. Colonial fruits of all kinds should have a very much stronger position in the British market. Canada and the United States lead in apples, and the West Indies, Colombia, and Canary Islands in bananas ;

but oranges still mainly come from Spain, which exports over nine-tenths of the supplies put on the British markets. Although South Africa, Australia, and the West Indies produce most excellent varieties, they send comparatively small quantities. Nuts for eating are still almost exclusively the produce of foreign countries; almonds mainly come from Spain, Morocco, and Italy; walnuts almost exclusively from France; and Brazil nuts, of course, from Brazil. Certainly so far as almonds are concerned there should be an opening for Australian produce. Imported margarine, largely a nut and kernel product, almost entirely comes from Holland; though large quantities are now manufactured in Great Britain from produce received from West Africa. In the case of sugar the position is still highly unsatisfactory, although the percentage of empire grown sugar has increased from 4 to 33 per cent. since 1913. The supply of beet sugar from Russia, Germany, Holland, and Austria-Hungary has almost entirely ceased, its place having been taken largely by unrefined sugar from Cuba and Java, refined sugar from the United States, and unrefined sugar from certain British possessions such as Mauritius and the West Indies.

The position with regard to raw cocoa has been radically changed during recent years. Even so recently as 1913 some 36,000,000 pounds came from foreign countries, particularly from Brazil and Ecuador, the former country sending one-third and the latter over a quarter of the total supply, and from Germany, Holland, Belgium, Portugal, and their colonies; while 41,000,000 pounds were imported from British possessions, mainly British West Africa, British West Indies, and Ceylon. At the present day 93 per cent. comes from British possessions, and only 7 per cent. from foreign countries. The German colonies have been eliminated, of course, as competitors, and the amounts from Ecuador, Brazil, and other countries have been largely reduced, while British West Africa has secured a practical monopoly of the market, although considerable quantities still come from the West Indies and, to a much less extent, Ceylon. As the total value of raw cocoa in 1920 was over £10,500,000 (in 1921 it was only £3,000,000), it will be seen that this is a record of which the British Empire may be justly

proud. In the case of tea the amount received from within the empire also shows a considerable increase, some 94 per cent. of the total in 1921 being grown within the empire against 87 per cent. in 1913. British India leads, of course, by a very large margin, followed by Ceylon and, far behind, by Java, China, and Uganda. The total value of the tea imports in 1921 was £23,111,000. Coffee as an article of consumption is far less popular in the United Kingdom than tea, the imports being worth only £2,411,000 in 1921. The amount of empire-grown coffee has increased, however, from 13 to 44 per cent., that grown in British territory coming chiefly from Kenya and Uganda, and British India, and that produced in foreign countries mainly from Brazil, Costa Rica, Java, Guatemala, Venezuela, and Colombia. With regard to the imports of wine the British Empire makes a very poor show, only about 5 per cent. being colonial-grown wines. This is to be regretted because some most excellent wines are produced overseas which should eventually obtain a strong position in the British markets. Tobacco, of which the consumption has increased enormously during recent years, is another product in which the British Empire is at present deficient. Only 3 per cent. of imported tobacco is grown in British countries, and in 1921 over £21,549,000 were sent abroad to purchase this commodity, the greater part going to the United States instead of to countries where it would be more useful.

With regard to the raw materials of commerce upon which the manufacturing prosperity of the United Kingdom depends, it is only necessary to consider briefly certain outstanding products that come to the markets of Great Britain. Comparing cotton and wool it will be found that while the former still comes mainly from foreign countries, chiefly America, the latter is almost exclusively the product of British overseas Dominions. Both have shown satisfactory increases since 1913, the percentage of empire-grown cotton having increased from 3 to 32 in 1921, and the percentage of wool from 79 to 90 during the same period. Flax, however, is still practically a monopoly of foreign countries, only 3 per cent. being grown within the empire; but practically the whole of the jute supply comes from India. In the supply

of rubber the British Empire leads by 82 per cent. to 18 per cent. ; but in the matter of petroleum the enormous increase in consumption, particularly for motor spirit and other similar purposes, has left the British Empire far behind, the percentage of empire-produced petroleum having decreased from 21 to only 5.

Another product in which the British Empire, in spite of its enormous resources, is still very far behind its competitors is wood and timber, which in 1921 was imported to the value of over £30,000,000, only 15 per cent. of which came from within the empire. Of the hard woods, mahogany mainly comes from French West Africa, Nigeria, and British Honduras, and teak from Siam and British India. Of the soft woods, such as fir, pine, spruce, etc., very large quantities still come from Russia, but the main source of supply is Sweden and Norway, though considerable quantities come from America and Canada. In the supply of unbleached wood pulp, mainly used for making paper, the largest supply comes from Sweden and Norway, although the amount received from Canada shows a constant increase. Up to the present, however, only 3 per cent. of this commodity comes from within the British Empire.

Of raw mineral products the greater part of the supply of asbestos comes from Canada and South Africa, and of asphalt and bitumen from Mexico, with smaller quantities from Trinidad and United States. Graphite largely comes from Madagascar and Japan, though Ceylon, and, recently, Natal have sent large quantities. Mica almost exclusively comes from within the British Empire, and iron-ore almost entirely from foreign countries, mainly Spain, Algeria, and Sweden. Of the non-ferrous metalliferous ores and minerals, chromium chiefly comes from India and Rhodesia, copper from Canada, Spain, Bolivia, and the Transvaal (and in the manufactured state from America, Australia, Chile, and the Belgian Congo). Lead (in the manufactured state), mainly comes from Spain, Australia, and Rhodesia ; manganese ores chiefly from British India and Russia ; tin ores from Chile and Bolivia, with Nigeria a good second, and manufactured tin from British Malaya, the Dutch East Indies, and Australia, in the order named ; while about four-fifths of zinc is imported from the

United States, with small quantities from Canada and Australia.

Taking into consideration the whole of the imports into the United Kingdom, it would appear that about 75 per cent. came from foreign countries in the year 1913, and 69 per cent. in 1921. This indicates a slow but steady increase in the amounts received from within the British Empire. At the same time this increase of 6 per cent. in imports has been balanced by an increase of 6 per cent. in exports of manufactured goods to the British Dominions, Colonies, and India. Analysing these figures into three main groups it will be found that products falling into the food, drink, and tobacco class have increased from 21 per cent. to 26 per cent. in the imports from British possessions; the raw materials group has increased from 26 per cent. to 30 per cent.; but in the group consisting of articles mainly manufactured, which includes copper, pig and sheet lead, tin and other manufactured metals, only 8 per cent. is received from British possessions, showing a decrease of 2 per cent. over the period in question. In all these cases, of course, enormous allowances must be made for increases in cost-price, and the only satisfactory comparison between different products at different periods is by weight or bulk, or number where that is possible. Such a comparison, however, is obviously impossible when many diverse products are being compared and in that case value alone can be taken as the unit of comparison. But, as suggested above, value is frequently extremely misleading: For instance, the amount of cocoa imported from Ecuador in 1919 was 177,000 cwts., and in 1920, 149,000 cwts., but the value respectively was £877,000 and £1,213,000. The above figures and percentages can only be regarded, therefore, as indicating somewhat roughly the trend of British trade and not as being a correct and unchallengeable statement of the whole position. In the present condition of statistical science, with its chaos of conflicting methods, its varied standards of weights, measurements, and currency; its differing methods of reckoning the origin of products, whether by country of production or country of shipment; and its extraordinary lack of uniformity; it is not possible to produce a statement that might be accepted as anything

more than an approximate estimate of the overseas imports of Great Britain.

Before concluding this chapter, it may be well to examine the principal avenues through which foreign and colonial produce enters the United Kingdom. Very little need be said about London, which for centuries has been not only a great port and a centre of the entrepot trade, but is also the central market for Dominion produce, although the Dominions have had direct steamship communication for many years with Liverpool, Glasgow, and Southampton, as well as London; while more recently services have been maintained with other ports. Colonial wool has long been the most valuable of the imports into London, which has been the world market for this commodity; though during the war great efforts were made to develop elsewhere the Australian and New Zealand trade, particularly at Liverpool and Manchester. At the first port from very small beginnings the wool trade has grown into a great business (although it is only about a quarter of London's total), and the warehouse established near Stanley Dock has accommodation for 160,000 bales, though its actual working capacity is smaller. Manchester, being the nearest port to Bradford, the centre of the wool industry, is now a competing port, owing to the construction of the Manchester Ship Canal, which has had a very great influence upon the trade of the north of England. Large wool-sheds have also been erected at Hull. Their capacity, however, is much less than that of the Liverpool sheds and comparatively little business is done. Previous to the war, wool was not bought and sold at Hull, but public sales have taken place periodically since 1920. Southampton also is a great wool port, owing to its trade with South Africa, and in this commodity is almost as important as Liverpool. With regard to tea, London is overwhelmingly pre-eminent as fully nine-tenths of the supplies come to the port, and the established course of business, which includes the importing, storage, and sampling of the tea, has not been greatly influenced by attempts to divert a portion of the trade elsewhere. The direct importation of tea into Manchester, Glasgow, and Liverpool is a recent development due to Governmental action during the war; but it remains to be seen whether it will be possible to

modify permanently old-established and conservative custom, and the tea dealers of Mincing Lane do not seem to have been greatly disturbed by the attempt to capture the London market.

In addition to London, which leads as the greatest wheat importing centre, the market in grain is chiefly centred in Liverpool, Manchester, Glasgow, and Hull; each port giving direct access to important centres of population that are not touched by the London market. Liverpool itself is a great grain port, and after Minneapolis it is the largest milling centre in the world; while at Glasgow, especially at Meadowside, there are granaries capable of taking 31,000 tons of corn. There are also large flour mills at Hull, where the granaries hold some 40,000 tons, while in the neighbouring port of Immingham the dock granary has a capacity for another 15,000 tons. The grain ports in their order of importance are London, Liverpool, Hull, Manchester, Bristol, Cardiff, Newcastle, and Glasgow.

The cotton imports are naturally chiefly received at the ports nearest to the textile districts, and are concentrated, therefore, in Liverpool and Manchester. The first port has had a long association with the West Indies, whence cotton first came to this country, and a cotton exchange has been established there for considerably over a century. Liverpool is, of course, the central world-market for this commodity and practically all the cotton reaching England is handled under the supervision of the Liverpool Cotton Association. In recent years large quantities have gone to Manchester by the Ship Canal, but Liverpool still leads as the port of entry as is shown by the following figures of the bales of raw cotton imported into Liverpool and Manchester respectively:—

DATE.	LIVERPOOL.	MANCHESTER.
1895	2,813,000	66,000
1910-11	4,349,000	709,000
1921-22	2,353,000	354,000

With regard to the imports of vegetable oils, the importance of which is growing year by year, the port of Hull has secured the premier position. Here cotton-seed, rapeseed, linseed, copra, palm kernels, soya beans,

and ground nuts are imported in enormous quantities, and their manufacture into useful products is conducted on a large scale—Hull being a great industrial centre as well as a port. A considerable portion of these products is used in the manufacture of paints and varnishes, of which Hull makes more than any place in Great Britain. Large quantities of margarine are also imported into Hull and Newcastle, while Liverpool has three-fourths of the trade in palm-kernels owing to its long and close connection with West Africa. In the butter trade, London has more than half the imports, but Hull, Newcastle, and East Coast ports, as well as Liverpool and Southampton, import very large quantities. The greater part of the cheese imports go to London, with Liverpool and Bristol very far behind. In the two latter ports the bulk of the banana imports is concentrated. For mineral oils London, very easily first, Bristol, Manchester, Hull, Liverpool, Glasgow, Newcastle, and Southampton, in the order named, are great centres of importation. At Birkenhead the oil depot covers nineteen acres of land, and at Newcastle, South Shields, and Jarrow there are enormous tanks—that at Jarrow having a capacity for 70,000 tons. At the port of Glasgow over 200,000 tons of oil were landed in 1921-22. In the tobacco imports Liverpool has had an unquestioned lead, but Bristol is also a considerable tobacco port, its connection with America being of very long duration, and London is not far behind Bristol in the quantity imported. The principal timber ports are London, Liverpool, Hull, Manchester, Glasgow, Newcastle, and Bristol, but very large quantities of pit props are imported into Cardiff and Newcastle, owing to their proximity to the coal areas, as well as into Hull.

Two food products in addition to those mentioned above should be noticed. The enormous amount of bacon brought into the United Kingdom is largely imported into Liverpool, though London is a good second, with the other great ports about equally divided. In frozen meat London leads by a very considerable margin, Liverpool coming a bad second, and the other ports, with the exception of Glasgow, hardly counting as serious competitors.

CHAPTER V

AGRICULTURAL FOOD PRODUCTS

Wheat.—The enormous increase in the world's consumption of wheat during recent years has proved a severe strain upon the productive capacities of the principal wheat growing countries. There is little doubt that a widespread failure of the crop would inflict great hardship upon those for whom wheat forms the staple cereal. Although the gloomy prediction made at one time by the Food Controller that we might possibly be dependent upon black bread is never likely to be fulfilled, and the equally gloomy forecast of Sir William Crookes, that the consumption of wheat would increase more rapidly than the area of production has been falsified, it is certain that a wide or even partial failure would cause a great rise in prices, and possibly lead to the reintroduction of measures of control, such as existed during and immediately after the war. On the other hand, abundant harvests are followed by reduced prices, so that producers get little return for their labour, and are apt to reduce the area under wheat in the following year.

Three countries are particularly susceptible to partial failure of the wheat crop—the Argentine, Australia, and India—while the United States, a great wheat producing area, is rapidly reaching, if it has not already attained, the limit of surplus of production in times of poor harvests.

Up to the present, however, production generally has kept pace with consumption, and the fears that have been expressed lest the growth of population, and especially an increase in the number of wheat-eaters, should result in a permanent dearth of wheat are not likely to be realised owing to the enormous areas of the as yet undeveloped wheat lands of the world, more especially in Canada and Australia. But although the consumption of wheat is increasing in quarters where it was not eaten

to the same extent before, it should be realised that the great majority of mankind still prefer other grains, such as rice, maize, rye, and the millets. This preference is not in all cases due to motives of economy. Nevertheless there is undoubtedly an increasing demand for wheaten flour throughout the world. So soon as the natives of Asia and Africa, for example, become accustomed to wheat many of them prefer it to their ordinary diet, and the demand for wheaten flour necessarily advances as the material prosperity of native peoples improves. Moreover, in such countries as Germany, under normal conditions, wheat is replacing rye, as an article of consumption; the *per capita* demand for wheat in Germany having advanced from 130 lbs. during the decade ending 1889, to 190 lbs. for the ten years ending in 1912. But the experience of the war has shown that many wheat-eaters without any very great hardship have been able not only to reduce their consumption but to substitute other grains for wheat when the latter is exceptionally dear. In any case it has been sufficiently proved that under the stress of abnormal demands farmers can rapidly increase their areas whenever wheat appears likely to be a more profitable crop than other cereals or produce.

In the year 1921, there was a large production of wheat, the estimated world's crop being some 3,130,000,000 bushels, of which the principal producing countries in the order named were the United States, France, Canada, India, Czecho-Slovakia, Italy, Argentine, Australia, Spain, Germany, and the United Kingdom. The elimination of Russia as a great producing and exporting centre and the increasing consumption of wheat in certain countries that hitherto have not been consumers, coupled with the low production in Central Europe, have led to unceasing efforts to increase the output of wheat within the British Empire; but there is naturally a limit to this production, imposed not by want of suitable land, but by the fact that more population in the Dominions is also an essential factor in increasing the output of wheat. It is evident that new wheat areas can only be opened successfully, if there is a constant flow of agricultural immigrants to the Dominions.

The total imports of wheat into the United Kingdom may be estimated at about 100,000,000 cwts., and the

home grown consumption at about 30,000,000 cwts., so that the total consumption may be put at some 243,000,000 bushels. It is perfectly clear, therefore, that Canada and Australia alone are in a position to supply the whole of the normal requirements of the United Kingdom out of their surplus production, should they be called upon to do so ; but unless the whole of their crops are bought by the United Kingdom, it is also evident that they will be diverted to the highest bidders in the open market, and that only a proportion of their wheat will find its way, as a general rule, to the British Isles. For this reason Great Britain normally imports large quantities from other countries, chiefly the United States (whose exports, however, include a considerable quantity of Canadian wheat), and the Argentine. The actual supplies from the Dominions therefore do not represent the possible supplies that in time of need can be diverted to Great Britain.

The position is well illustrated, of course, by the controlled operations that took place during the war, when the British Government bought enormous quantities in order that the people of the United Kingdom should not starve. In the case of Australia, for example, some 3,000,000 tons of wheat were purchased on one occasion by the British Wheat Commission at a total cost of £26,000,000—the largest wheat transaction ever recorded. This policy of control during the war secured for the Australian growers full financial returns for their industry. A wheat-marketing scheme was entered into by the Government of the Commonwealth and the Australian States by which all growers participated equally in the realisation of their harvest, and the limited freights then available were allotted between the different States in accordance with the exportable surplus of each.

Measures of control were also introduced into Canada, and the story of the great coup of the Dominion Government, which on November 28th, 1915, just before the stoppage of navigation on the Lakes, commandeered all the wheat at the terminal ports—a sudden and totally unexpected action that almost caused a panic on the Winnipeg Grain Exchange—forms one of the most romantic and impressive actions in the whole annals of

commerce. The effects of this proceeding were far-reaching and from that time forward, State regulation became a feature of the war-economics of Canada, although the control of the grain markets was not worked in the same way as in Australia. In the latter country the total amount of wheat controlled under the pooling system during the six seasons from 1915-16 to 1920-21, was 639,000,000 bushels, of which 358,000,000 bushels were shipped to Europe, fetching a total of £127,000,000. The arrangements for pooling collectively were not extended beyond the 1920-21 harvest, but voluntary pools were established in Victoria, New South Wales, and South Australia, and a Government compulsory pool has been continued in operation in Western Australia.

Compulsory pooling, however, is really only possible in time of war, and it may be said that notwithstanding every effort that has been made during the past few years to increase the available supplies of wheat there is a partly unsatisfied demand for bread-stuffs that has increased prices and has proved that the world does not at present possess any real surplus of the staple food of most Europeans. Before 1914 more than half the world's wheat was grown in Europe, but war and revolution have profoundly affected domestic production, and the total crop of the year 1913 (4127 million bushels), has not again been reached. While production in the old countries of Europe has declined it has been stimulated elsewhere by the higher prices that can be obtained, and the Dominions are now supplying much of the wheat that used to be exported from Russia and the Balkan States to the British Isles and Western Europe generally. The great opportunity that occurred for an increase in empire production is shown by the fact that in 1911 Russia exported over 140 million bushels—an export that has entirely ceased owing to the economic experiments of the Soviet Government. As the elimination of Russia as an exporting country enabled the Dominions to seize and retain the new markets that have been opened to their produce, it will be well to examine briefly the chief wheat areas of the British Empire, and to describe the increasing part they are taking in supplying not only the needs of the mother country but in conquering new overseas markets.

Unquestionably Canada is the greatest wheat producing country in the British Empire and there are not wanting those who believe that before long it will become the greatest wheat area of the world. When Sir William Crookes some years ago made his alarmist prophecy of the impending world shortage of wheat, the great wheat producing areas of the Prairie Provinces had not been fully tried, but to-day it is certain that with sufficient population and satisfactory prices the present productive capacity of Canada in wheat could be increased until it may reach, if it may not surpass, the wheat production of the United States. In the three prairie provinces of the Dominion there are some 446,000,000 acres of land, while the present acreage of wheat under cultivation in the whole Dominion does not exceed 24,000,000. Not all of this land is suitable for wheat, but undoubtedly vast regions are still available, and it should be remembered that, up to a certain limit, the farther north wheat is grown the better it is. In this respect the hard northern wheat of Canada is stated to be of better quality than the Australian produce, although the latter is of even grade and has good milling qualities.

The rapid development of wheat growing in Canada is shown in the following statement : —

PERIOD.	ACREAGE.	AVERAGE PRODUCTION IN BUSHELS.
1881-90	2,300,000	36,000,000
1901-10	5,900,000	106,000,000
1909-13	10,522,000	200,500,000
1914-17	13,771,000	265,644,000
1918	17,344,000	206,064,000
1921	23,260,000	300,857,000

In the year 1921 the exports of wheat were 129,215,000 bushels, of which 29,294,000 bushels went direct to the United Kingdom, and 42,324,000 bushels were sent through or imported into the United States. In the year 1922, the total export was 136,489,000 bushels; 92,498,000 bushels going direct to the United Kingdom.

Though wheat is grown in almost every province of Canada the great wheat belt is the western prairie, extending over the three provinces of Manitoba, Saskatchewan, and Alberta, and the finest region is the rich

valley of the Saskatchewan, where the grain grows to perfection, and the yield in some places averages over twenty-six bushels to the acre. It may here be said that compared with the high yield of wheat in some European countries, especially Denmark, where heavy manures are used, the yield per acre in Canada, India, South Africa, and Australia is comparatively small. This is largely due, in the three Dominions, to lack of fertilisers, and partly in India to inefficient methods of cultivation. The following were the average yields per acre during 1919:—

Denmark, 47.5.	Argentina, 15.7.	South Africa, 9.0.
New Zealand, 32.7.	India, 12.6.	Australia, 7.2.
United Kingdom, 29.2.	United States, 12.5.	
Egypt, 25.3.	Canada, 10.1.	

The year 1919 was, in some countries, a bad season, and in Australia the average for ten years has been 10.69, and in Canada, over five consecutive years, it has been 20.0. Manitoba has an area of 73,732, square miles, and the soil is a rich, deep, alluvial loam. Saskatchewan has a similar climate and soil. Alberta, situated on the eastern slopes of the Rocky Mountains, was at one time considered unsuitable for wheat owing to lack of rain over certain large districts. As the cold is less intense than it is farther east, and it is also more easy to irrigate the lands in the dry areas owing to their natural fall from west to east, wheat production has become a profitable industry. In the northern Peace River valley there are very fine wheat lands and grain can be successfully cultivated even as far north as the Yukon Territory in latitude 63 N.

Nearly the whole (upwards of nine-tenths) of the immense output of wheat in Canada goes through Winnipeg (where there is a great wheat exchange), through which over 1000 carloads of wheat pass daily, practically all being carried in bulk in order that it may be stored in the great grain elevators which form such unsightly edifices in many a Canadian city. At the twin ports of Fort William and Port Arthur on Lake Superior, there are thirteen immense terminal elevators (so called because

here the grain inspection terminates and the wheat is graded for export), the wheat being distributed in bins according to the quality that has been assigned to it, before being placed in the specially constructed steamers which carry it across the lakes for shipment to Europe, through the Canadian ports of Montreal, Halifax, and St. John, or via Buffalo and the American ports of Portland, Boston, New York, Philadelphia, and Baltimore. The whole process of forwarding and grading the wheat is highly organised—much more so than it is in Australia—and the bulk-handling, which is only just coming into use in the Commonwealth, enables the crop to be dealt with expeditiously and cheaply.

Australia as a wheat producing country has enormous possibilities, but here again the factor of population is an important consideration. Wheat is the principal farm crop in the Commonwealth, and approximately half the cultivated area is under this cereal. The area under cultivation, however, is relatively small in comparison with the immense regions still unoccupied, and it has been estimated that the acreage under wheat in the four principal States, New South Wales, Victoria, South Australia, and Western Australia, could be increased at least five-fold, while Queensland has large areas suitable for wheat which undoubtedly will be occupied as that country is developed. The progress made in the production of wheat in Australia is illustrated in the following statement :—

PERIOD.	ACREAGE.	AVERAGE PRODUCTION IN BUSHELS.
1860-61	152,000	2,520,000
1887-90	3,200,000	25,920,000
1908-1913	6,791,000	78,676,000
1914-17	10,727,000	112,727,000
1919-20	6,419,000	144,243,000

It will be seen that Australia has made a great and successful effort to increase her production, but up to the present she has not been so successful in developing the bulk-handling of the commodity, as the Victorian, South Australian, and Western Australian schemes are still in abeyance. In New South Wales, however, the erection of a terminal elevator at Sydney is practically complete,

and it is in operation, while country elevators, which have long been urgently needed and will have a capacity for 13,300,000 bushels, are being erected at sixty-two different places in the State. But Australia is essentially conservative in its methods and a considerable prejudice still exists, partly owing to the at present heavy charges for using the elevators, against any method but handling in bags.

The principal wheat areas in Australia are on the tablelands and western slopes of New South Wales, with a rainfall of from eighteen to thirty inches. The greater part of this area was at one time purely pastoral country, but wheat growing, owing to increasing settlement, has made rapid strides, and as new varieties of seed better able to withstand drought are produced, and as methods of dry-farming are practised, the wheat area is continuously being pushed into regions which were considered at one time to be entirely unsuited for cereals. In the plains between the Murray and Darling Rivers, known as the Riverina, where great irrigation schemes have been undertaken, is another large wheat area, and with the increase of transport in the southern regions of New South Wales, mentioned on page 55, there is sure to be a great extension of wheat growing. In Victoria the northern districts, and the Wimmera and Mallee regions to the west of the western bend of the Murray River, are the principal areas for wheat, while in South Australia the country around Spencer and Vincent Gulfs is particularly suited to the crop. It is quite evident, however, that while Australia's contribution to the empire's wheat crop is an important and growing one it bears but a small proportion to her capacity of production. So many surprises have come out of the soil of the Commonwealth that, with the spread of scientific information and the knowledge of how best to utilise the soil, it is difficult to regard the idea of a five-fold increase as being anything but a very guarded estimate of the potentialities of Australia as a wheat producing country.

Compared with Canada and Australia the other wheat areas of the Empire are of small importance so far as the food supply of the United Kingdom is concerned, because they consume, at present, practically the whole of their own supplies. New Zealand, which, partly owing to the

use of manures and partly owing to the natural fertility of the soil, produces more wheat per acre than any other British country, now consumes more wheat than she produces, and cannot hope to export this cereal, although much more might be cultivated, without a considerable increase in the farming community. The yield per acre over all the years during which statistics have been kept has been 27.1 bushels, but it has been as high as 48.71, and last year it was 39.56. Wheat in New Zealand is grown principally in the central and southern portions of the South Island, 71 per cent. coming from the Canterbury district and about 25 per cent. from Otago and Southland.

India is a great wheat producing country and in good years the surplus is bought by exporters, and no time is lost in putting it on the British market because, as it is a winter crop, it arrives in England at a period when the wheat supplies generally are low. Although during 1913 over 18,000,000 bushels were imported into Great Britain, an export almost equal to that of Canada in the same year, the export to Great Britain practically ceased during the war, and no considerable quantity has been imported from India since, although large amounts have been shipped to other countries from Karachi, Bombay, and Calcutta—the first being the greatest wheat port of India and exporting practically four-fifths of the available surplus. Nevertheless in normal times India still has a considerable surplus of production, which can be diverted to the United Kingdom whenever it may be requisite to do so. At the present time India's surplus exports of wheat and flour are mainly sent to countries bordering on the Indian Ocean, such as Ceylon, Kenya, Mauritius, and Zanzibar; to the Red Sea ports; and to Persia, Muscat, and ports on the Persian Gulf; though large quantities are also sent to Germany, Holland, Belgium, France, and Italy. The exports of Indian wheat and flour during 1919-20, 1920-21, and 1921-22 were 1,126,000 cwts., 5,958,000 cwts., and 1,934,000 cwts. respectively. Wheat is grown chiefly throughout northern India, especially in the United Provinces and the Punjab, which supply about two-thirds of the total area under the crop and probably about three-quarters of the output. The total area under wheat in British India was 22,685,000

acres in 1914-15, and 19,147,000 acres in 1918-19, and the total yield of British India and certain native states was 201,740,000 cwts. in 1914-15, and 150,040,000 cwts. in 1918-19, comparing an average good year with an average bad one. While, therefore, cultivation has increased steadily during several years—an increase largely due to the immense irrigation schemes that have been undertaken by the Government—the growth of population and consequent consumption of wheat have kept pace with it, and there is no reason to believe that the position will be greatly modified in the future. Similarly in South Africa the consumption of wheat is constantly increasing and considerable quantities are imported to supply the local demands. The production within the Union has been as high as 8,000,000 bushels. Wheat can be grown in Rhodesia on the high plateau and in the Kenya Colony on the Uasin Gishu plateau, but the quantities grown at present and the immediate possibilities of the future do not appear to warrant an assumption that any surplus will be available for export, until and unless the labour supply and the agricultural settlement of both countries are largely extended.

Maize.—While wheat remains predominatingly the chief cereal food of the United Kingdom, and is imported to the extent of about 77 per cent. of the total consumed, there are other cereals that occupy an important position in the food supply. Among cereals that are exclusively obtained from abroad are maize and rice, and among those of which certain quantities are grown in the United Kingdom are oats, barley, and rye. In addition there are certain products which although not cereals may for convenience be considered here—such as tapioca, sago, and arrowroot; certain cereals such as millet, which are only used in this country for feeding animals, although extensively consumed elsewhere as human foods; and certain beans, peas, and allied products which form an important part of the food economy of the United Kingdom.

The use of maize when grown in this country is practically confined to the feeding of cattle as it is a crop which requires a warm climate, and does not readily ripen without plenty of sunshine. Quite apart, however, from its present importance for human food, and for feeding to

cattle, pigs, and poultry, as well as for the production of starch, it is of great potential value as a cheap and easy source of industrial alcohol. It is, therefore, of some importance that the available sources of supply within the British Empire should be greatly extended, because at the present time fully 97 per cent. of our imported maize comes from foreign countries, although large areas are available where the crop can be successfully grown within the British Empire. In the year 1920, 33,840,000 cwts., valued at £27,371,000 were imported—nearly the whole of this vast sum going to increase the prosperity of foreign countries, particularly the Argentine—instead of being used in the development of British territories. South Africa is at present the chief maize exporting country within the empire, but as the natives consume large quantities and also a great amount is required for feeding stock, the surplus available for export is not, at present, large. The maize belt of the Union of South Africa embraces the country lying east of the 26th meridian, with the exception of the coastal belt and mountain area; and the principal productive regions are the Transvaal and Orange Free State. In addition there are immense areas available in Rhodesia, but here the question of haulage to the coast is a serious factor, as the railway rates are high, and must necessarily add to the cost of production. Within the Union the output of maize has increased enormously during the last twenty years. In 1904, only 10,834,000 bushels were grown, but in 1918 this amount had increased to 28,000,000 bushels, and it is now 30,000,000 bushels. Other potential maize areas are to be found in Kenya and the great undeveloped regions of Central Africa, while the Commonwealth of Australia (particularly New South Wales and Queensland) grows considerable quantities, but at present imports more than is produced locally. There are, however, vast areas available for this crop, especially in the Northern Territory and Western Australia, but present economic conditions do not suggest that there will be any available surplus for export within a reasonable period. In India practically the whole crop is consumed locally.

Barley.—Barley, which is much less nutritious than wheat, is largely used in this country, for the production

of malt, and for making whisky. Large quantities are grown, therefore, in Scotland and Ireland, but it is not so important a crop in England as wheat and oats. Of the home consumption about 60 per cent. is grown locally, the overseas supply coming chiefly from the United States and Canada, although very large quantities used to be imported from Russia. Of the exporting countries in the British Empire, in addition to Canada, India is the only area that has a permanent surplus; although Australia, during the last few years, has exported considerable quantities (3,209,000 bushels in 1920-21), and may be looked upon as a potential source of supply.

Oats.—Oats, which require a cooler and moister climate than wheat or barley, can be grown in more northerly countries. In the United Kingdom oats are cultivated as far north as the Orkneys, and in England the area under oats has been greater than that under wheat. About 75 per cent. of our requirements are produced in the United Kingdom, the greater part of the remainder coming from the Argentine and Canada. Within the empire, Canada is the principal oat producing country and actually grows more oats than wheat, as they are cultivated all over the Dominion and in addition can be grown even in Newfoundland, which is unable to produce other cereals. In 1916 some 10,996,000 acres were under oats, with a total crop of 410,211,000 bushels, and in 1921 about 16,949,000 acres were under cultivation, producing 426,232,000 bushels, of which amount about 36,000,000 bushels were available for export. In Australia only about one million acres were under oats, the principal oat growing State being Victoria; but production has not yet reached a regular export and in certain years the imports have exceeded the exports. The yield per acre is low, being 11.8 bushels (1919), compared with 54 bushels in Holland, 39.9 in the United Kingdom, and 23.1 in Canada. Large quantities of oats are imported into Great Britain from Canada in the form of rolled oats and compete with Scotch oatmeal as a favourite breakfast dish. New Zealand is also an excellent country for oats.

Rye.—Rye is the least familiar of the cereals in Great Britain, with the exception of millet. It is cultivated largely on the Continent as a bread plant. Its use in

this country is inconsiderable and only small quantities are imported, the greater amount coming from Canada.

Rice.—Rice forms so important an article of food within the British Empire, particularly in the tropical countries, that a large or even partial failure of the crop in India, such as occurred in 1918-19, is followed by disastrous consequences owing to its immediate rise in price and the necessarily restricted consumption by large numbers of people for whom rice forms the staple food. So far as the British working man is concerned, such a failure is not a matter of immediate concern because there are plenty of substitutes to take the place of rice, and the national consumption of some 200,000 tons is not a large one when it is compared with wheat and other cereals. But in the case of the natives of India and Ceylon, British Malaya and Hong Kong, and the many thousands of Asiatics settled in British colonies, a failure of the rice crop means almost immediate hardship and privation. It is, therefore, a matter of very great importance that the available rice areas of the British Empire should be more fully developed, particularly as large exports of the available surplus are always bought by foreign countries, so that the supply of empire-grown rice available for use within the empire is restricted further by the outside demands.

The greater part of our supplies of rice are grown within British India, and more particularly in Burma, where, fortunately, a failure of the rains is unknown. The production of rice within India proper even in a normal year is not sufficient for the needs of the population, and the immense quantities that are grown within the great deltas of the rivers flowing into the Bay of Bengal, in Assam, Madras, and the United Provinces, are consumed locally; the needs of the population being supplemented by supplies from Burma. The surplus in that country is ordinarily some 2,500,000 to 3,000,000 tons, and very large quantities are exported to the United Kingdom, the rest of Europe, the Straits Settlements, and Ceylon. In the case of Ceylon, where great quantities of paddy, that is rice with its husks, are grown, it is always necessary to import outside supplies (to the extent of 290,000 tons in 1921), in order to feed the hundreds of thousands of Indian agricultural workers

who are employed on the plantations. Much of this supply comes from Burma, while Mauritius, South Africa, and other British colonies where there is an Asiatic population have also to import large quantities of rice.

It has been estimated that the world-production of rice is about 90,000,000 tons, of which about one-third is grown in China, and about 40 per cent. in India, though her average exports seldom exceed 7 per cent. of her estimated production. With the exception of Burma the only countries that can afford to export rice are Siam and French Indo-China, although in bad years these regions have to import instead of export. It is, therefore, of more than ordinary importance that there should be a considerable development of rice cultivation within the British Empire, and fortunately several areas are available should the necessary labour be forthcoming. One of these areas is in British Guiana, which is already in a position, on occasion, to export small quantities of rice and produced nearly 30,000 tons in 1921. Another area is to be found in Kenya where the coastal belt is undoubtedly capable of growing large quantities, particularly in the Tana and Sabaki valleys, should irrigation works be undertaken. In certain parts of Uganda rice is already an important native crop capable of considerable extension. In British Malaya, where rice is extensively cultivated, it is still necessary to import from Burma and Siam and government control of the rice supplies was necessary until 1921. There are, however, large areas where rice could be successfully grown. In the case of the West African colonies rice is cultivated at present only for the local food supplies, and although much more could be grown it has, in certain cases, to be imported. This is particularly the case in Sierra Leone, where the swampy areas are capable of yielding vast quantities, and in the delta area in Nigeria; and as has been pointed out (see p. 39), there are large areas suitable for rice in Uganda, Sudan, and Central Africa generally. With regard to Australia there are large regions available for the cultivation of rice in the northern coastal areas of Queensland, Western Australia, and the Northern Territory; but the lack of population and of coloured labour will for many years to come militate against the development of these potential sources of supply. It seems

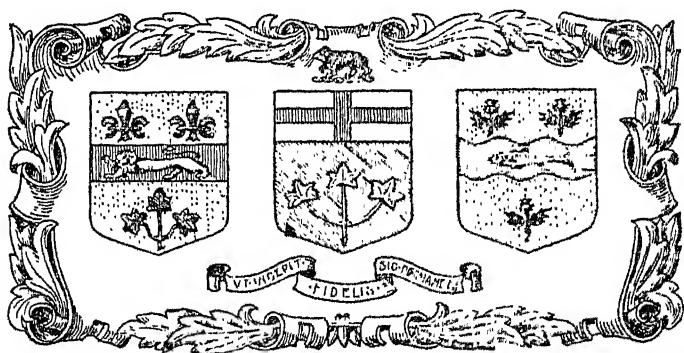
probable, therefore, that the main supplies will continue to be drawn, as heretofore, from Asiatic countries; although some development may possibly take place in Africa, more especially to supply the needs of the local market.

Millet.—Millet is a grain that although extensively grown in the tropics and in semi-tropical countries, does not enter largely into commerce. It is of very small importance in the United Kingdom, and is only used as a feeding-seed, but in certain countries such as West Africa, South Africa, the Sudan, and India, it is extensively used. There are numerous varieties of millet. In South Africa the term kaffir corn is applied both to the durras, which are of North African origin, and to the kaffir corn proper, both belonging to *Sorghum vulgare*; and it can be grown in districts where maize cannot be cultivated successfully. In India millet forms the staple food of the agricultural population in Madras and the Deccan, and is very little inferior to maize as a human food. Moreover, as a fodder crop, it is of very great value. In the Sudan it has undergone a great development and there are considerable exports to Europe and Egypt, as much more is grown than can be consumed locally. In 1916, over 100,000 tons were carried over the Sudan railways and durra now forms the heaviest crop in the Sudan.

Tapioca, sago, and arrowroot.—Tapioca, which is obtained from the poisonous tubers of the *Janipha manihot*, is imported into the United Kingdom chiefly from Java, although a considerable supply comes from British Malaya. The total consumption in 1920 was 704,000 cwts., valued at over one million pounds sterling. It forms, therefore, an important article of domestic consumption. Sago is one of the chief foods of the natives in the East Indies and Malaya and is principally imported into this country from the Federated Malay States and Straits Settlements. In 1920, 556,000 cwts. were imported. Arrowroot is derived from various plants, but only small quantities are imported, chiefly from the West Indies where it is the product of *Maranta arundinaceæ*.

Peas and Beans.—A great variety of edible beans is imported into the United Kingdom, and these now form

a valuable article of human consumption. In 1920 over 1,280,000 cwts. were imported, about a third coming from India, and the rest mainly from Madagascar and China. During the war a great demand arose for the white Burma beans to take the place of the haricot beans so largely grown in the Danubian provinces, and the total amount of these beans and pulses exported from India increased from 114,000 tons in 1913-14 to 229,000 tons in 1917-18, valued at £2,438,000. In addition to the beans used for human food, such as the well-known butter bean, largely the product of Madagascar, numerous other varieties are consumed as feeding-stuffs for animals. Amongst these are the locust beans, the product of the carob tree, considerable quantities of which are imported from Cyprus (over 26,000 tons, valued at £201,000 in 1920).



Arms of

Quebec.

Ontario.

Nova Scotia.

CHAPTER VI

EMPIRE FRUIT

THE enormous increase in the consumption of fruit within the United Kingdom during recent years and in the production of fruit within the British Empire has been due very largely to the facilities offered by cold storage on board ship, improvements in transport, and the fact that much of the fruit grown abroad or in the Dominions arrives at a period when home grown fruits are scarce or unobtainable. If we compare the nature and quality of the fruit sold in the British markets with that of only a few years ago, we see what great progress has been made. Compared with the period of our grandparents the advance has been colossal. In the reign of George III., to go no further back, there were practically no bananas, oranges, pineapples, or other warm-climate fruits on the market—or they were the luxury of the rich—while the home grown fruits were frequently of an inferior variety, that would have no sale nowadays. The progress that has been made, however, may be continued in the future in view of the large variety of tropical fruits that are as yet scarcely known in Europe, and are only waiting active exploitation to introduce them to the British public. A few years ago the grape-fruit, which now finds a ready and increasing sale, was practically unknown, while the avocado pear and many other delicious fruits are still almost unobtainable.

It has been computed that the turnover in the fruit trade in the United Kingdom is at least one hundred million sterling per annum, and it is probable that the amount is increasing steadily year by year. If we take the year 1920 as a standard, we find that the total value of the fresh fruits imported into Great Britain, exclusive of nuts for eating but including dates, was £35,333,000, and that a considerable proportion of this trade was with the Dominions and British Colonies, although the amount

imported from within the empire is very much less than it should be. In 1913 about 83 per cent. of imported fresh fruit was from foreign sources and only 17 per cent. from British countries. In 1920 the proportions were 79 per cent. and 21 per cent. respectively, showing an increase of 4 per cent. in the fruit imported from within the British Empire. It is evident that these figures, in view of the great possibilities of the Dominions, as producers of fruit, are not satisfactory, particularly when it is remembered that in Australia, for example, vast quantities of fruit are left to rot and that during the summer months there is a glut in the local markets—fresh pineapples fetching a penny each in Queensland, and much fruit being quite unsaleable. Distance and lack of transport are, of course, primary factors in this waste—just as lack of organisation and co-operation in England are responsible for the loss of great quantities of fruit. In the case of Australia, however, other factors are at work and the Australian producer has as yet very much to learn from the marketing methods employed in such a country as California, where the fruit trade is highly organised upon a co-operative basis.

The fruits imported into the United Kingdom fall naturally into two categories, although both of these overlap—those that are grown in countries of temperate climate, such as apples, pears, plums, cherries, and currants, and those that come from countries of a warmer or even tropical climate, such as oranges, lemons, limes, peaches, grapes, apricots, bananas, and pineapples. As the latter category of fruit is more important so far as actual imports are concerned, it is desirable to examine the present sources of supply in order to see whether British countries are sending the quantities that might be supplied to the mother country could the various difficulties in the way of packing, transport, and marketing be effectively overcome.

Oranges, without doubt, form the most important fruit imported into Great Britain from countries of warm climates. In 1920, oranges to the value of over £8,000,000 were imported, about 95 per cent. of which came from foreign countries, the remainder coming from South Africa, the West Indies, and Australia. The greater part of our oranges comes from Spain, with a smaller quantity

from Italy, Asiatic Turkey, and Palestine. It is evident that there is a great opening for oranges from British territories, more particularly as most excellent varieties are now produced in Australia, the Cape Province, and Rhodesia. In the case of Australia it is only necessary to mention the fine oranges produced along the River Murray. There are now over 30,000 acres of orange plantations in the Commonwealth, every State contributing with the exception of Tasmania, which owing to its cooler climate is more suited for apples. Australian oranges have now been shipped in cold storage and there is no reason why if State supervision and co-operative methods of packing and marketing are adopted, Australian oranges should not find a ready sale on the British market. As yet, however, both with regard to Australian and South African oranges, the arrangements for cold storage on board ship are not perfected and one of the main problems of export is to obtain proper ventilation and the exact degree of temperature suitable for maintaining the fruit in the best condition. With regard to South Africa, from which oranges to the value of about £20,000 are now exported annually, the Union Castle Company have done much to encourage export and there are now about 1200 tons of cold storage available each week. South Africa and Australia are in a particularly fortunate position with regard to the cultivation of citrus fruit, because the oranges produced in Spain, Italy, and Palestine all come to the market at approximately the same season, whereas the South African and Australian fruit can reach England when oranges are scarce. Other possible sources of supply are the Kenya Colony, although growing is at present confined to the needs of local markets, and Nyasaland; while the West Indian trade, always considerable, is capable of extension. Similarly, lemons, which almost exclusively come from Italy (chiefly Sicily) and Spain, could be imported from those British countries which at present grow oranges. Limes form an important article of production in the West Indies, particularly Dominica, but can be grown on the coastlands of Queensland, Natal, and other British countries.

The second most important article of consumption in raw fruits from warm countries is bananas. Although

the fruit was imported into England many years ago, the industry was mainly started by the late Sir Alfred Jones, who, when visiting the Canary Islands in 1884, told the inhabitants to "stop weeping and grow bananas." His advice was laconic but effective, and for some time the Canaries had a practical monopoly of the trade. When, however, the problem of bringing bananas some four thousand miles from the West Indies and landing them in perfect condition was solved, a new and formidable competitor to the Canary bananas established itself upon the market. The West Indian banana trade was mainly created through the action of Mr. Chamberlain in granting a subsidy to the steamships carrying the fruit, and, although many thousand pounds were at first lost over the venture, the industry, in spite of great opposition from interested quarters, obtained a firm hold on the British market. In 1920, bananas to the value of £6,468,000 were imported, the greater part coming from the Canary Islands and Colombia, but more than one-fifth coming from the British West Indies. As bananas can be grown successfully in many tropical countries, including West Africa; and in the Southern Hemisphere, in Queensland, New South Wales, and the Pacific Islands; there is practically no limit to the sources of supply save the nature and cost of the available transport.

The third most important warm country fruit is dates. The date-palm unlike the coconut only grows in districts at considerable distances from the sea. It is most extensively cultivated throughout Northern Africa and in the valley of the Euphrates. Though the Sahara and the hot lands of the Northern Hemisphere are the true home of the date-palm, there is no reason why it should not flourish in countries like Queensland, Western Australia, and the Northern Territory of Australia. In the first country it has been acclimatised and the Commonwealth Government grants a bounty in order to encourage the industry. Dates are also grown in California. Our present supply comes mainly from Mesopotamia, although small quantities come from India and Egypt, and larger supplies from Morocco, Algeria, and Tunisia. In 1920 the value of the imports was £2,780,000 and there does not seem much probability of any considerable proportion of this amount coming from within the British Empire,

as the supplies of the Sudan are almost entirely consumed locally. Grapes, as an article of consumption, are almost as important as dates, over £2,000,000 worth being imported in 1920. They are grown chiefly in Spain, but considerable quantities come from the Channel Islands and from South Africa. Those from the latter country are chiefly the product of the south-western district of the Cape Province (especially Stellenbosch and Paarl), and although the local consumption is large there has been a considerable surplus for export during recent years. Australia is also a great grape producing country. Apart from the grapes used for wine, about ten thousand tons are used for table consumption, but at present they are usually exported in the dried state or as wine. Pineapples are chiefly imported in syrup from the United States and Hawaii among foreign countries, and from British Malaya and Australia among British territories. Singapore is one of the great world centres for the export of tinned pineapples, and the industry there, or in its neighbourhood, is of very great importance. In 1920 pineapples to the value of £843,000 were imported from British Malaya. Many other portions of the British Empire are suitable for the cultivation of the pineapple. Queensland, for example, is capable of producing enormous quantities of excellent quality and about 4000 acres are under cultivation; while in the Cape Province and Natal pineapples are extensively grown and small quantities exported. Pineapples can be grown in nearly all countries where the climate is warm and moist enough and the export of the surplus production only depends upon proper canning facilities and adequate labour and transport.

The most important of the temperate fruits are apples. In 1920 over £9,503,000 worth were imported into the United Kingdom and of this amount some 35 per cent. came from within the British Empire, Canada supplying apples to the value of about £2,784,000 and Australia to the value of £911,000. The great apple-producing districts of Canada are in south-western Ontario, Nova Scotia, Quebec, and British Columbia. In the last province the Okanagan Valley grows about 80 per cent. of the local production and in Nova Scotia the Annapolis Valley is the great apple centre. It is

stated that the west coast districts of Newfoundland are also suitable for apple growing. In nearly all the Australian States the cultivation is increasing but Tasmania is at present the great apple centre, and grows about 40 per cent. of the total Australian production. Of the other imported fruits it is only necessary to mention pears and plums, which come almost exclusively from France, Belgium, and the United States, although considerable quantities of pears are now exported from South Africa.

A very important and growing industry in connection with fruit is the export of dried fruits of various kinds from the Dominions, especially Australia. Great efforts to increase the industry are being made in the Commonwealth and to secure a more substantial preference in the home markets for the Australian produce. Previous to the war, this industry was limited in extent and the Commonwealth market was chiefly catered for ; but the advance of prices on the London market led to a great increase of production, so that whereas before the war the Commonwealth consumed about 80 per cent. of its own products it is now exporting about 80 per cent. and consuming only 20 per cent. It is not possible to discuss here the effects of a preference in the British markets, but it is probable that with increasing foreign supplies and falling prices the definite advance indicated at the recent Economic Conference in connection with an increased preference to dried fruits will result in a considerable extension of the industry. When it is considered that during 1920 raisins to the value of £3,368,000 were imported, chiefly from Spain and Asiatic Turkey, with considerable quantities from India, Australia, and South Africa, and dried currants to the value of £5,129,000 almost exclusively from Greece, it will be seen what a large field there is for expansion within the British Empire in these two forms of dried fruits alone. The Commonwealth's net exports of raisins in 1920-21 were valued at £518,000 and of dried currants at £208,000 ; but only a comparatively small proportion of these reached the United Kingdom.

Finally, with regard to fruits mention must be made of the excellent colonial jams that have been put on the British market. They were specially in evidence during

the war when large quantities were imported for the use of the troops. A substantial preference in the home markets is now enjoyed by colonial jam, but it is as yet too early to judge of its effect upon the industry, and the question of the price of sugar will always be a predominating factor in connection with the jam industry. In 1920, of jams, marmalade, etc., imported (£944,000) over £853,000 worth came from British countries, mainly Australia and South Africa; but there does not seem to be much room for an expansion of this trade except at the expense of home producers, as the supplies from foreign countries are at present negligible.

With respect to wine, although there is a considerable consumption in Australia and South Africa, it is a singular fact, illustrative of the conservatism of the British race, that in those countries of the empire where wine is produced and is cheap, overseas Britons, although not as neglectful of their excellent wines as are people in Great Britain, do not drink anything like the amount, proportionately, that is consumed by the Latin peoples of Southern Europe. It is true that Australia consumes nearly ten times as much of her home wines as she exports, and that South Africa consumes nearly twenty times as much—the local surplus in 1920-21 being about ten million and seventeen million gallons respectively—but compared with beer the amount is small. There is not the slightest doubt that a great opportunity exists for the introduction of more Colonial wines into Great Britain, which is flooded with cheap wines from France, Portugal, Italy, and Algeria, but consumes very little of the Australian and South African wines. It is evident that a consumption of foreign wines to the value of £5,437,000 in 1922 (£17,978,000 in 1919) and Colonial wines only to the value of £194,000 is most unsatisfactory. There are many reasons for this small consumption of overseas wines apart from the prejudice that exists amongst those who have not tasted them, not the least of which is the strong hold on the market of the dealers in foreign wines and the difficulty of getting the great hotels to stock Colonial wines—an attitude that is inspired by other than patriotic motives. The Colonial wine trade has therefore a great fight before it if it is to obtain a proper position in the mother country, quite

apart from any question as to the quality and permanence of particular brands of wine.

The great wine producers of the empire are Australia (particularly South Australia and Victoria), South Africa, and Cyprus. In Australia production has shown a continuous increase during recent years, being now double what it was in 1916-17, and in South Africa the amount has doubled in the decade; but the total imported into the United Kingdom does not show a corresponding increase. The three wine producers of the empire are essentially different with respect to the history of the culture—Cyprus with its ancient civilisation and centuries-old cultivation of the vine, South Africa with its experience of viticulture and established brands since the Dutch first founded their wine farms in the neighbourhood of Cape Town, and Australia with its comparatively recent organisation of the industry. The cultivation of the vine for wine making is peculiarly a trade that requires great knowledge, care, and attention; and it is extremely difficult to re-establish a brand that has once earned a bad name. For this reason the wine producers of the empire are making every effort to standardise their wines.

In the case of Cyprus with its dependable climate and season-temperature, everything requisite for the production of good wine is present, with the exception of an intelligent and trained peasantry. The small farmers still persist in following the methods employed possibly thousands of years ago, under the more degenerate conditions of to-day. In the Cape Province the conditions are ideal for wine-making, but here the industry was spoilt for a time owing to a desire of the farmers to obtain the heaviest crops regardless of quality. The South African wines, therefore, have had to outlive the bad record which they undoubtedly established, but it is only necessary to mention the famous Constantia wines to demonstrate the high quality that can be attained. With regard to Australia, where, as in South Africa, wine-growing is now a great industry, the cultivators have had great difficulties to contend with, but the Australians have adopted scientific methods, and there can be no doubt that they will soon be in a position to extend greatly their export trade in wine.

CHAPTER VII

VEGETABLE OILS AND FATS

THE consumption of vegetable oils and fats, the production and manufacture of which from the raw product to the finished material now form one of the most important industries within the British Empire, has increased very largely during recent years. Early in the war it became evident that with the practical elimination of Germany, Austria-Hungary, and Russia as consumers, and the interference with the Marseilles trade owing to the mobilisation of all the available man-power in France, profound changes were likely to occur not only with regard to the distribution of the raw products used in the oil-industry, but also with respect to the manufacture of very many articles of daily consumption that were produced in the oil-crushing mills of Germany and other countries affected by the war. The export of certain materials from India and the tropical colonies, which hitherto had been largely consumed and manufactured in the enemy states, was impossible and it became necessary to ascertain what industrial uses could be found in the United Kingdom for the materials in question.

At the outbreak of war by far the greater portion of the oil-seeds exported from within the British Empire was sent to continental countries, and the United Kingdom was at a decided disadvantage in having to import large quantities of manufactured oils and feeding-cakes, margarine, and other products of a similar character, from foreign countries. In the case of copra, the dried kernel of the coconut, for example, Ceylon, the greatest exporter within the British Empire, sent over 50,000 tons to foreign countries in 1913, and only 750 tons to Great Britain. Similarly India exported over 38,000 tons and only sent 350 tons to the United Kingdom. In the case of palm-kernels exported from British West Africa, 130,000 tons went to Germany, and only 30,000 to Great

Britain, while of the ground-nuts exported from India, the chief producing country, 277,000 tons were sent to foreign countries, principally France, and only 480 tons to England. Practically the whole of the Gambia crop was divided between France, Germany, and Holland. It was evident, therefore, that Great Britain was only indirectly benefiting from the enormous wealth in vegetable oils contained in her tropical possessions and that there was ample scope to establish upon a permanent basis an oil-crushing industry, which had languished hitherto within the United Kingdom owing to the difficulty of competing with the established factories of Germany, Holland, and France.

It is not proposed to describe the steps that were taken to transfer to Great Britain some at any rate of the great industry that had been built up in Germany and other countries, except to state that steps were almost immediately taken to investigate the sources of supply, the nature of the raw materials, and the uses to which they could be put ; to encourage by every possible means the establishment of factories with oil-crushing machinery ; to persuade farmers to utilise so far as possible the residue of production in the form of cake and meal, without which it would scarcely have been possible to put the industry upon a satisfactory basis ; to experiment with new and little known materials ; and to find new manufacturing uses for the vast accumulations of raw materials that were awaiting shipment from British countries.

The aid of science and industry was enlisted, and after the war fiscal experiments also were tried in West Africa, where differential export duties were introduced in order to prevent the sending to the Continent of the raw materials which had been successfully diverted to this country. These experiments were so entirely successful, that whereas before the war, to take the palm-kernel-crushing industry alone, Hamburg had been the great distributing centre, consuming some 254,000 tons of kernels as compared with 36,000 tons imported into Great Britain, in 1920 the German imports were not much more than 15,000 tons compared with 286,000 tons imported into the United Kingdom. In other words Hamburg as a great importing and milling centre had

ceased to exist. Similarly the imports of ground-nuts increased from a very small amount in 1913, to about 125,000 tons in 1920, and copra from 30,000 tons to 57,000 tons; although, as a set-off, it must be remembered that the importation of other oil-seeds, such as linseed, rape, and cotton-seed, has decreased.

The enormous increase in the oil-crushing industry in Great Britain has been one of the direct results of the war. Previous to 1913 about sixty different firms were engaged in crushing seeds in Great Britain, chiefly for the sake of the production of cake and meal, while the European seed-crusher was principally engaged as an oil producer. Although the actual number of seed-crushers has not been greatly added to, their productive capacity has enormously increased, one firm alone with its combined branches handling at least 50 per cent. of the total output. At the present time Hull is undoubtedly the greatest vegetable oil centre in Europe, but large centres of manufacture have also been established in Liverpool, London, Dundee, Glasgow, Grimsby, and other ports.

The industrial uses to which vegetable oils can be put are so varied—from the manufacture of edible oils such as margarine, and cooking fats to the making of soap and candles; the manufacture of paint, varnish, oilcloth, and linoleum; the lubrication of machinery; the manufacture of glycerine (which was a paramount consideration during the war); and the preparation of feeding-stuffs for cattle—that there seems hardly a limit to the possibilities of the industry. Moreover, the constant improvements that are being made in the methods of extraction, either by means of machinery or by other processes, tend to bring into the area of edible oils many oils that hitherto have been purely of industrial value. As science and research advance it is certain that many and new uses will be found for these products; and for this reason the resources of our tropical possessions in vegetable oils are one of the most valuable, if not the most valuable, of our Imperial assets.

In the year 1920 oil-seeds and vegetable oils to the value of about £76,500,000 were imported into the United Kingdom, inclusive of gums and resin, but exclusive of products such as turpentine, obtained mainly from pine, but also from larches, and sent to this country

almost exclusively from North Carolina to the value of £3,219,000 in 1920 (£1,061,000 in 1921); margarine, coming almost entirely from Holland, to the value of £5,514,000 in 1920; and other manufactured articles based upon vegetable oils.

The oil-bearing seeds, with one great exception, come almost entirely from tropical countries and they may be roughly divided into four great classes; those containing 45 per cent. and over of oil, such as ground-nuts, sesame, castor, mowrah, copra, and palm-kernels, the three former producing the liquid oils and the three latter the solid or hard oils which only melt at a comparatively high temperature; and those which are less rich in oil, such as linseed, cotton-seed, nigerseed, poppyseed, rapeseed, soya beans, all providing liquid oils. In addition there is a multitude of other oil-seeds or nuts, such as the cohune nut, which is so plentiful in British Honduras, the coquilla, illipi, and coquita nuts: but many of these are at present difficult to crush and their industrial use is, therefore, for the time being comparatively small. Or if we take the imports into the United Kingdom as they are arranged in the Board of Trade Returns, the oil-seeds and vegetable oils and their products may be divided into five great categories, some of which, however, overlap. These are the cake made for animal feeding-stuffs, such as cotton-seed, ground-nut, linseed, rapeseed, and soya bean cakes, of which 225,000 tons were imported in 1920 to the value of £3,649,000; the seeds imported for expressing oil, such as castor, cotton, flax or linseed, rape, sesame, sunflower seeds, and the soya bean, of which 912,000 tons were imported valued at £26,874,000; the nuts and kernels for expressing oil, such as copra, ground-nuts, and palm-kernels, of which 476,000 tons valued at £19,449,000 were imported; the gums and resins, of which 89,000 tons to the value of £8,544,000 were imported; and the actual vegetable oils—castor, coconut, cotton-seed, ground-nut, linseed, olive, palm, palm-kernel, rapeseed, sesame, soya bean—of which 211,000 tons to the value of £17,923,000 were imported. The last are expressed either in their country of origin or in some European country, but are exclusive of oils refined on the Continent or in America, of which considerable quantities are still imported. In considering the supplies

of the British Empire it is necessary to examine each of these products in some detail, but before doing so attention should be directed to the chief producing centres.

India is the most extensive producer of oil-seeds in the British Empire. The annual production of seeds is estimated at over five million tons with an aggregate value of £50,000,000; and the exports in 1913-14, to take an average year, were equal to about one-third of the total. If to these exports be added the residual cake and oil, the aggregate value of India's annual export trade under this head is some £18,000,000. In three of the oil-seeds India had a practical monopoly of the world's trade in 1913-14, viz., castor-seed, mowra-seed, nigerseed, while she exported 76 per cent. of the poppy-seeds, 66 per cent. of the rapeseed, 46 per cent. of the ground-nuts, 42 per cent. of the sesame-seeds, and 33 per cent. of the cotton-seed. In addition to these seeds and linseed, certain other plants are cultivated for their oils. These are coriander, cummin, ajwan (the source of the valuable antiseptic thymol), and kardi or safflower, from which carthamus oil is extracted.

Next to India, West Africa is the most important source of vegetable oils as the original home of the oil-palm and many other plants used for the extraction of oil. In 1913, over 234,000 tons of palm-kernels were exported from British West Africa and in addition there was a large trade in copra, ground-nuts, and the shea-nut. The last is the product of the tree so enthusiastically described by Mungo Park, who over one hundred years ago wrote that "the butter produced from it, besides the advantage of its keeping the whole year without salt, is whiter, firmer, and, to my palate, of a richer flavour than the best butter I ever tasted made from cow's milk." The shea-butter tree grows in those parts of West Africa where the oil-palm does not flourish, and vast and unexploited supplies exist in Northern Nigeria and in the north of Ashanti. It will almost certainly be one of the most extensive and important vegetable-oil products of the near future. Other oil-producers of West Africa are the coconut and ground-nut, while the soya bean is being tried in various districts, and the strephonena nut, the n'gore nut, the n'kamba nut, the n'kula nut (not to be confounded with the kola nut, which forms so

important an item of native produce in West Africa), the kamoot nut, and the dika nut, obtained from the wild mango, are only a few of the numerous oil-producing nuts or seeds that may be extensively used in the future.

The Oil-Palm.—First in commercial importance among the oil-producers of West Africa is the oil-palm, which is indigenous to the country from Senegal to Angola, but is most plentiful in the region extending from Sierra Leone to the Cameroons, from the seaboard towards the interior. The African oil-palm, or *Elæis Guineensis*, has been used by the natives from a very remote period and almost every part of the tree serves some useful purpose. Two important products are made from the fruit. Oil is expressed from the pericarp either by wasteful native methods or, more recently, in oil mills which have been established at various places through the enterprise of European firms. Before the war some 78,000 tons of palm-oil were imported into Great Britain. In 1920 the amount was 99,000 tons, valued at £6,982,000. This was used chiefly in the manufacture of soap and candles and as a lubricant. The second product is the oil expressed from the kernels, which are imported in enormous quantities, the residue, after the expression of the oil, being used as cake or meal for animals. Palm-kernel oil is increasingly used for making margarine and various edible fats, and factories of considerable magnitude have sprung up at Hull, Liverpool, and many of the principal ports. The influence of the war had a very marked effect upon the development of the trade, and it is interesting to note that the two principal Dutch companies that were engaged in exporting margarine to the United Kingdom thought it expedient to establish their own plants in this country. The imports of palm-kernels reached 304,000 tons in 1919, valued at £10,910,000, of which more than four-fifths came from British West Africa, mainly Nigeria and Sierra Leone. Great quantities, however, are grown in and exported from the Cameroons, French West Africa, Nigeria, and the Belgian Congo (in the last of which countries Messrs. Lever Bros. have established an enormous interest). In view of the considerable supply that exists outside the British Empire the charge that we were seeking to establish a monopoly is, therefore, without foundation.

Unlike rubber and copra, palm-oil is not as yet a plantation product except in the Dutch East Indies and Malaya. In Sumatra and Java experiments have been tried for many years to establish a flourishing industry, which would be independent of British and French control. So long ago as 1848 the famous Botanical Gardens at Buitenzorg received four plants of *Elæis Guineensis*, and the now flourishing plantations in Netherlands India have all been grown from the seeds of these four trees, although other seeds have been imported during recent years. The growth of a plantation industry in Sumatra, which is the principal producing island, has been a slow process, and in 1914 only 6500 acres were planted with the oil-palm. In 1922, however, the number had increased to 28,000 acres, and it is hoped to have 100,000 acres in ten years' time yielding about 100,000 tons of oil, or a quantity approximating that exported to Europe from West Africa. As it is claimed that the oil-palm bears fruit in the East Indies in its fourth year,¹ whereas it does not bear in West Africa under six or seven years, it is obvious that oil-palm plantations will become a serious factor to be reckoned with, should it be possible to extend this industry in Java and Sumatra, and other countries of the East. At present West Africa has a practical monopoly, but in view of the rise of the rubber plantation industry and the virtual collapse of wild rubber as a competitor, the introduction of plantation methods into another great industry requires careful consideration. The sources of supply are so enormous, however—it is estimated that in the Gold Coast alone at least £1,000,000 worth of palm-products go to waste annually—that there can be no possible shortage for many years to come; but there is no reason why such countries as Ceylon and the Malay States should not eventually, in conjunction with the Dutch East Indies, compete with the African products. Oil-palms are already being grown in British Malaya, and it is estimated that some 65,000 acres have been planted in Johore alone. There is no doubt, however, that the Dutch have spent very large sums in perfecting their plantations and factories in the East Indies, and that within a very few years keen competition will result

¹Rutgers, A. A. L., Investigations on oil-palms. Batavia. 1922.

between the Netherlands Indies and West Africa. It is not desirable here to enlarge upon the results of the differential duties on the exports of palm-kernels from West Africa and the subsequent abandonment of these duties, as acute controversy has arisen over this question, but it is tolerably certain that the fear of the Dutch that they might lose their enormous Continental trade in margarine, as a result of the progress made in the manufacture of vegetable oils in Great Britain, was the predominating cause of the great expansion of the plantation industry in the Dutch East Indies.

Coconut.—The total exports from all countries of copra during the year 1913 was about 380,000 tons, of which about 30,000 tons were imported into the United Kingdom. The latter amount had increased to 57,000 tons in 1920, and in addition 66,000 tons of coconut-oil were imported into Great Britain, as much coming from Java as from within the British empire itself. The coconut-palm from which these two principal products are obtained flourishes along the sandy shores of tropical lands, and large plantations have been established in many British countries. Within the empire, Ceylon and the Straits Settlements are the principal exporters, the exports of India, although they represent about one-tenth of the world's trade in copra being considerably smaller than those of Ceylon. In 1913-14 they were 38,000 tons of copra and 1,091,000 gallons of oil, compared with 55,000 tons of copra and 25,000 tons of oil from Ceylon. As illustrating the variety of products obtained from the coconut tree the following figures of exports from India in 1913-14 are of interest:—

PRODUCT.	QUANTITY.	VALUE.
Coconuts	Number 344, 000	£1,517
Coir fibre	Tons 740	11,449
Coir manufactures	" 38,600	592,000
Cordage and rope ..	" 3,000	70,000
Copra	" 38,000	1,039,000
Coconut cake	" 4,700	27,000
Coconut oil	" 4,500	155,000
	(30,000 in 1918-19)	
		<hr/> 1,897,000
		K

As is the case with palm-kernel oil and ground-nut oil, the oil expressed from the coconut is largely used in the manufacture of margarine and various other butters and fats, and for making soap and candles, while the residue, known in India as poonac, is used as an animal feeding-cake. The fibre of the outer shell is called coir and is used for matting, but is not extensively imported into the United Kingdom.

Apart from India, Ceylon, and British Malaya, coconuts are grown largely in the South Pacific, especially in Fiji, Tonga, Papua, the Solomon Islands, and the Gilbert and Ellice Islands; in the coastal regions of Kenya and Tanganyika; on the islands of Zanzibar and Pemba; in the Seychelles and other islands in the Indian Ocean; and to a smaller extent in West Africa (chiefly in the Gold Coast), and in the West Indies, principally in Trinidad. The export of crude copra for the purpose of expressing the oil seems likely in the not distant future to be diminished owing to the expression of the unrefined oil on the spot. Both in India and Ceylon very large supplies of oil are produced at local factories particularly as the consumption of the oil itself is very large in India where in certain provinces (Bengal for example) it has been larger than the local supply. The advantage of producing the oil locally is that the residuum in the form of a valuable cattle food is then usually consumed on the spot. Similarly oil mills have been established both in the Eastern and Western Pacific and plantations in all the Pacific islands have been greatly extended during recent years.

Ground-nuts.—The principal countries from which ground-nuts are exported are India, the Gambia Colony, Senegal, Nigeria, and China, although the plant (*Arachis hypogæa*) flourishes in many other parts of the world, and is grown in the Anglo-Egyptian Sudan, Malaya, Kenya Colony, Tanganyika, Uganda, Natal, and numerous other districts within the British Empire. The sources of supply are, therefore, practically unlimited, and as the nut is highly nutritious and contains a large proportion of oil which is used for edible purposes, such as the manufacture of margarine, as well as for making soap, while the residue after the expression of the oil forms a valuable food for live-stock, the cultivation of the ground-nut is

continuously increasing. Apart from the value of the ground-nut as a food—immense quantities are consumed under the name of monkey-nuts in this country and as pea-nuts in the United States—and the other uses mentioned above, the oil has excellent qualities as a salad oil and is extensively used as a substitute for olive oil. Previous to the war the approximate quantities of ground-nuts exported from the principal producing countries were the following :—

COUNTRY.	TONS.	VALUE.
India	277,000	£3,254,000
Gambia	67,000	622,000
Nigeria	19,000	174,000
Senegal and French Sudan	187,000	1,188,000
Java	170,000	1,600,000(?)
Portuguese East Africa ..	5,000	49,000
China	50,000	549,000
	<hr/> 775,000	<hr/> £8,136,000

The greater part of this enormous export was sent to France, in the form of both undecorticated and decorticated nuts, that country taking nearly nine-tenths of the total exports and manufacturing the greater part into soaps and oils at Marseilles. At the present time, however, large quantities are imported into the United Kingdom, about 125,000 tons, valued at £4,486,000, being imported in 1920.

The greater part of the crop grown in India, which is the largest producing country, is grown in the Madras Presidency; Burma and Bombay being the other producing centres. In addition to the exports of the actual nut large quantities of ground-nut cake (62,000 tons in 1913-14) and oil (288,000 gallons in 1913-14, and 1,057,000 gallons in 1917-18), are also exported, while the consumption of the nut in India itself is very large, the yield varying greatly in different years, from 1,196,000 tons in 1916-17 to 490,000 tons in 1918-19. The crop grown in the Gambia Colony does not show such large variations. These range from 47,000 tons in 1911 to 96,000 tons in 1915, the average for a period of ten years ending 1919, being 65,000 tons per annum. Here the cultivation of the

ground-nut forms the principal industry of the Colony, the nuts being grown entirely by native proprietors and by immigrant farmers who enter the colony each year and after the harvest return to their own homes. Similarly in Nigeria the crop is grown by natives, and the building of the railway to Kano, by providing an outlet for the great quantities grown on the plains of Northern Nigeria, gave a great impetus to the industry. On April 30th, 1920, there were over 66,000 tons of ground-nuts at Kano waiting to be railed to the coast, and with the extension of railway communication an ever-increasing output may be expected, with the result that Northern Nigeria is likely to exceed the Gambia Colony as the chief British territory in Africa exporting ground-nuts.

Linseed.—The trade in linseed and linseed-oil, with the resultant cattle food in the form of cake, is one of the most considerable in the British Empire, the imports of linseed into the United Kingdom alone in the year 1919 reaching a total value of £20,662,000 (£15,688,000 in 1920), with a total weight of 552,000 tons. Of this amount three-fifths come from within the British Empire, almost entirely from India, although previous to the war Canada had sent very large quantities of linseed to this country. The principal source of supply outside the British Empire is the Argentine. Flax is cultivated both in temperate and warmer climes for its fibre and seed. In India, however, it is almost exclusively used for its seed and practically all the seed and resultant oil and cake are exported. The quantity of linseed exported from India has varied very largely. In 1904-5 over 559,000 tons and in 1918-19 only 292,000 were exported. It must be borne in mind, however, that the local production of linseed-oil has largely increased, the exports having reached as much as 1,674,000 gallons in 1918-19, the greater part of this amount having gone to Hong Kong, New Zealand, and Australia, the actual growth of flax in the last country being practically negligible in spite of the great efforts that were made to extend the industry by the granting of bounties and Government encouragement.

Cotton-seed.—Like linseed the seed of the cotton plant is also a great oil-producer. As cotton will be dealt

with under the heading of fibres it is only necessary here to give some indication of the chief sources of supply of the seed, the quantity of which imported into the United Kingdom closely approximates our total consumption of linseed. In 1913, 615,000 tons were imported, and in 1920, 442,000 tons, the greater amount coming from India and Egypt. The first country contributes about 2,000,000 tons to the world's total of 11,000,000 tons, but the exports in a year of plenty do not exceed 15 per cent. of the production, the greater part being consumed by cattle as uncrushed seed or being crushed for cake and oil. The production of the latter in India, is, however, very limited, as the scientific utilisation of the vast Indian supplies of seed has, as yet, hardly been attempted. The cotton-seed oil imported into, or produced in, the United Kingdom is used both for edible purposes and for the manufacture of soap, nearly all the vegetable oils being mutually replaceable under certain conditions of price and supply. Thus the soap-manufacturers can use almost every kind of oil, while the makers of margarine and other edible fats are able to employ almost equally well palm-kernel oil, coconut oil, ground-nut oil, sesame oil, and cotton-seed oil.

Sesamum.—Sesame or sim-sim is cultivated throughout the warmer regions of the world, but the seed is produced for export on a large scale in comparatively few countries, the consumption of the crop being generally local. The chief exporting countries are India and China—the exports of each being approximately equal, about 110,000 tons per annum. Comparatively small quantities, however, are sent to the United Kingdom, where it is chiefly used as a component of feeding-cakes, as it is very rich in oil. Enormous quantities were sent to European countries previous to the war, the result of which is still shown in reduced exports from nearly all producing countries. The chief growers in the British Empire, which supplies fully half of the world's production, are, in their pre-war order, India, Anglo-Egyptian Sudan, Kenya, Uganda, and Nigeria. In all Eastern countries sesame is extensively used in cooking, for mixing with edible fats, for the preparation of perfumed oils, and even as an illuminant, while the residual cake is employed as

a food for animals. In Europe it is used both in the making of soap and of margarine, while Germany and other central European countries use immense quantities of seed for the production of feeding-stuffs for cattle.

Olive oil.—The production of olive oil has been regarded for so long a period as the peculiar monopoly of the Mediterranean countries, that it seemed unlikely a few years ago that competitors would arise in other parts of the world. Practically the whole of our domestic supplies have come from France, Spain, and Italy, and although the consumption of pure olive oil in this country is not nearly so large as it is in most Continental countries, especially among the Latin nations, or in South America, there is still a considerable market that might be captured by British growers. If to this be added the large markets in South America and the colonial markets it will be seen that there is a good opportunity of establishing a flourishing olive industry in those parts of the British Empire that are able to grow olives. At present they are being cultivated in South Australia, and both New South Wales and Queensland are stated to be eminently suitable for the growth of olives.

Rape, and castor seeds, and the soya bean.—Among the minor oil-producers only rape and castor seeds and the soya bean need be specifically mentioned. From the first colza oil is manufactured. India is practically the only source of supply within the British Empire, no other British countries exporting rape-seed to any extent. The amount imported into the United Kingdom, although it has increased very largely since the war (from 14,000 tons in 1913-14 to 76,000 tons in 1919, and 22,000 tons in 1920), is inconsiderable in comparison with the other principal oil seeds. Castor-seed, of which India for some years enjoyed a practical monopoly of the world's export trade, has decreased, on the other hand, as an import into Great Britain, while the quantity exported from India has similarly declined. This does not imply that the amount grown in India decreased, as the production of castor oil increased largely during the same period. As the castor oil plant flourishes in the Sudan, Kenya, Rhodesia, and many other countries, there is an abundant source of supply within the British Empire; but considerable supplies are now coming from Brazil, and other

South American countries. With regard to the soya bean, of which the consumption in Great Britain has largely decreased, the main supplies used to come from Siberian Russia, Manchuria, and China, although it is now being grown in West Africa. The total value of our imports in 1920 was £350,000 compared with £635,000 in 1913. In other words the imports had decreased from 76,000 tons to only 15,000 tons.



Arms of Fiji.

CHAPTER VIII

FORESTRY AND TIMBER

IN the year 1920 timber and wood to the value of £82,124,000 were imported into the United Kingdom, and of this amount about £66,090,000 worth came from foreign countries, mainly Northern Europe and the United States, and to the value of £16,034,000 from British countries. The British Empire, therefore, secured a little less than 20 per cent. of this immense trade, in spite of the fact that within its boundaries are enormous and unexploited supplies of timber only awaiting adequate railway and steamship communications to make them available for the service of mankind. The nearness of the Baltic countries gives them a considerable advantage in the soft woods, such as fir, spruce, and pine, which form by far the greater part of this immense import ; but in the case of some of the hard and ornamental woods, such as mahogany and teak, there appears to be no adequate reason why the United Kingdom should continue to draw largely upon foreign sources, nor does there seem to be any reason why the United States should export to this country staves and sleepers, deals, planks, and boards, at the expense of Canada. If to the total amount of timber and wood is added the pulp of wood imported for the manufacture of paper, the discrepancy between the amount supplied by the British Empire and by foreign countries is even more striking, as the imports were £25,226,000 from foreign countries and £4,259,000 from British territories, making the grand total over £111,609,000.

Before describing the chief timber districts of the British Empire, it will be well to examine two short tables based upon the figures for 1920, showing the British countries which supplied timber to the United Kingdom, and the amounts of various kinds of woods imported from all countries.

The Resources of the Empire

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COUNTRY.	TIMBER. £	PULPWOOD. £
Canada	12,137,000	3,775,000
Australia	250,000	
India	2,497,000	
Nigeria	423,000	
Gold Coast	97,000	
British Honduras	290,000	
British Guiana	26,000	
British E. Indies & Straits Settlements	117,000	
British West Indies	17,000	
Other British countries, including Newfoundland and Labrador ..	180,000	484,000
	<hr/> 16,034,000	<hr/> 4,259,000

NATURE OF TIMBER OR MATERIAL.	SOURCE OF SUPPLY.		TOTAL.
	BRITISH. £	FOREIGN COUNTRIES. £	£
Mahogany	794,000	1,530,000	2,324,000
Walnut	20,000	129,000	158,000
Oak	183,000	2,320,000	2,503,000
Teak	2,535,000	541,000	3,076,000
Other hard woods	1,656,000	2,767,000	4,423,000
Soft woods (fir, spruce, pine—including deal and planks) ..	8,784,000	25,440,000	33,798,000
Boards	662,000	8,980,000	9,642,000
Other sorts of sawn woods ..	530,000	4,241,000	4,771,000
Floorings	6,000	4,014,000	4,020,000
Matchings	—	587,000	587,000
Other sorts of planed woods ..	—	889,000	889,000
Pitprops	—	9,369,000	9,369,000
Staves	36,000	3,604,000	3,640,000
Sleepers	813,000	1,531,000	2,344,000
Veneers and panel-wood ..	3,000	82,000	85,000
Not specified ..	3,000	66,000	69,000
Pulpwood	4,259,000	25,226,000	29,486,000
	<hr/> 20,293,000	<hr/> 91,316,000	<hr/> 111,609,000

It is apparent from these figures that the British Empire has considerable leeway to make up if she is to be even partially self-supporting in the matter of timber. On the other hand the supplies of the Empire are so large, especially in Canada, that given the possibility of competing economically with foreign countries, there should be no difficulty in obtaining, for many years to come, almost the whole of our supplies of certain timbers from within the empire. It is evident, however, that with the constantly increasing consumption of timber the sources of supply will not last for ever. It has been computed with regard to Canada that the supply of timber will be exhausted in 120 years—which seems a very liberal estimate of the length of time before Canadian timber is worked out—but that if the present annual consumption is increased the supply will last a very much shorter period. This is, of course, a very serious position, for forests, as well as supplying timber, have a profound effect upon climate and rainfall. In certain parts of Africa the effects of the destruction of forests have been marked. It is almost unnecessary to point to the classic example of Northern Africa under the Moslem domination. The danger of the exhaustion of forests and timber resources has been met to some small extent in practically every British Territory by the creation of a Forestry Department employing trained officials, who are in a position to report upon the timber resources and the best means of preserving them for the use of posterity. In Canada, in addition, there is an important Commission of Conservation whose duty it is to watch carefully and report upon the natural resources of the Dominion and to keep the Government informed upon all matters connected with the conservation of forests, fisheries, and animal life. For the Empire at large there is the Empire Forestry Association which takes a broad survey of our Imperial resources and is able, although it has no official status, to bring pressure to bear in directions where it may be chiefly needed.

Although these steps have been taken in Canada and other countries, it is undoubted that the timber resources of the world are being rapidly exhausted. With the example before them of the United States, where the vast forest and timber resources were prodigally squandered

and ruthlessly destroyed, it would have been thought that practically every country would have taken really effective steps not only to preserve its supplies, but to plant for the use of future generations. It may be said, however, that only one country in the British Empire has an effective policy of forest control. Under the able management of the Indian Forest Department there is a systematic control of the felling of timber, and an organisation of replanting with a view to a continuity of future supplies—an example of State management that should be followed in countries like Australia and New Zealand, where the timber resources, although there is much better control than formerly, have been sacrificed as settlement has proceeded. There is no more depressing sight than during a journey through a long stretch of Australian country to see only the gaunt skeletons of trees in regions that were formerly well wooded. These trees have not been destroyed by forest fires, but have been deliberately sacrificed in order to make as much land as possible available for agriculture or pastoral enterprise, without consideration for the beauty of the landscape or the value of even a few trees for purposes of shade and for supplying fire-wood. In Canada, where forest fires cause enormous destruction, steps have been taken to organise an air-patrol, as fires can be detected and located much sooner from an aeroplane than by any other means; but very little has been done, apparently, in the way of afforestation to replace the supplies of timber that are so rapidly being cut down. In any case it is certain that what is primarily needed in the Dominions is a strong central authority able to supplement the work of the Forest Departments by a rigorous control of all sources of supply. Similarly, in the Crown Colonies there is required a central controlling authority, if possible in Great Britain, working through the local Forestry Departments and only issuing permits to cut timber on the advice of the local experts. In fact a survey of the timber resources of the British Empire, or at least of those portions over which the Colonial Office still exercises control, is urgently needed so that we may be able to take stock and provide in time for our future needs.

Canada.—The forest belt of Canada stretches right across the continent from the Atlantic to the Pacific,

and has a breadth of some two or three hundred miles, while in British Columbia the slopes of the Rocky Mountains form an enormous forest reserve, probably as rich in timber as any part of the Dominion. Estimates of the amount of timber available in Canada vary greatly. A rough estimate of 250,000,000 acres covered with trees that could be sawn into timber, with a very large additional area containing timber suitable for pulp, has been made by the Forestry Department; and of this amount some 100,000,000 acres are in Quebec, 70,000,000 acres in Ontario, and 50,000,000 acres in British Columbia, the rest being distributed throughout the other provinces. The spruce is probably of the greatest commercial importance, but in British Columbia and the mountain zone of Alberta the Douglas fir yields splendid timber of the largest size, while in Ontario the white pine is the most largely cut. In addition cedars are common and are largely cut in Ontario and Quebec, and maple trees, the characteristic tree of Canada, are used for lumber and fuel. While the soft woods of Canada are in the greatest demand, the Dominion is by no means deficient in the harder timbers of commerce. In addition to ash, maple, and birch, the rock elm is extensively cut and exported. The value of the forest produce of Canada has been estimated to be worth, on the pre-war average, £37,000,000 per annum. In 1918, it was worth £27,826,000, and in addition to the actual timber over 1,557,000 tons of pulp were made for the manufacture of paper and 967,000 tons of paper produced, and the total value of timber exports, exclusive of pulpwood, was £10,380,000. The principal centre of the Canadian timber trade is at Ottawa, where many of the most important mills are established, through which are passed vast quantities of pine and spruce, from the watershed of the Ottawa, before being transferred to Quebec for shipment to Europe; but lumber-camps and mills exist in many other districts, particularly in British Columbia, where they are situated either on or within easy reach of the coast.

India.—Turning our attention to India, one of the most important sources in the British Empire of the hard timbers imported into Great Britain, we find that the Indian forests are a source of considerable profit to the State and yield a net revenue of more than one million

sterling. The area under the control of the Forest Department is over 250,000 square miles, of which more than two-fifths have been brought under regular management and systematically conserved and worked by the Imperial Forest Service. The timbers of the Indian Empire are of almost innumerable varieties, and the local consumption is very large; but not more than a dozen kinds are supplied to the outside markets, and even then the exports are practically confined to one variety—teak—which ranks as the best timber for constructional purposes and is classed above oak and every other wood. Teak is chiefly exported from Burma, although there are plantations in the Malabar district of the Madras Presidency and elsewhere. Among other timbers satin wood and rosewood, which are largely used for furniture, and the various kinds of ebony are exported, whilst East Indian sandalwood, which is practically limited to a restricted area in Southern India, chiefly in Mysore and Coorg where all the trees are the property of the State, is used extensively for small articles and for the extraction of the oil, which is one of the oldest indigenous industries in India. The value of the sandalwood and its oil exported from India in 1918-19 was £237,000, about one-quarter going to the United Kingdom. In addition to India there are extensive forests in the Malay States where, it is estimated, there are some 32,000 square miles of forest areas, about two-thirds of which contain merchantable timbers; while in Ceylon there are another 20,000 square miles, of which only one-fifth contains commercial timbers within reasonable access. Here, however, the hard woods are likely to be exhausted in about ten years; although with care the forests will be able to supply fuel for the island during an indefinite period.

Africa.—With regard to Africa generally the southern area, exclusive of Rhodesia, may be dismissed as a source of exportable timber. Throughout the whole of the Union there are only about 2,360 square miles of forests. Comparatively small forests occur in the Knysna and Humansdorp districts of the Cape and on the Drakensberg and Lebombo mountains, but most of the forest areas have been heavily exploited and the virgin timber is approaching exhaustion. It is only as the tropical regions are reached that the great forest zones of British Africa are

found. West Africa, for example, contains two great forest belts and supplies a very great part of the mahogany imported into Great Britain; but so far as British territory is concerned the timber is almost confined to the Gold Coast and Nigeria, neither Sierra Leone nor the Gambia containing any valuable forest zones. In the former Colony the forest area is less than 1000 square miles in extent and in the Gambia there are no forests at all.

The story of timber in the Gold Coast, with its 38,000 square miles of forest, is a romantic one, but it is the same history of squandered resources as that of most British Colonies. Fortunately, however, the supplies of timber are very large and varied, and with proper supervision there is no reason why the timber of this Colony should not last for a very long period, as a large part of Ashanti, and the whole of the western portion of the Gold Coast Colony proper, are covered with forests. The principal feature of this area is the great size of the trees, and the high monetary value of the timber. Similarly in Nigeria, there are very large areas of exportable timber, estimated to be some 50,000 square miles in extent, with a further 168,000 square miles of less valuable or at present inaccessible timber. The bulk of the timber is in the southern districts, and much of it is either mahogany or other hard and durable wood. In the Niger Delta especially the forests are particularly valuable, and being within easy reach of the sea there is a considerable export trade, especially around Onitsha on the Niger and Elehetem on the Cross River. The exports of timber from the Gold Coast and Nigeria are considerable, about 75 per cent. from the former Colony going to the United States, and the rest to Great Britain. It should here be stated that so far as the West African forests are concerned four powerful factors are operating against them. The first is the extension of the influence of the Sahara—an influence that is continuously creeping southward and increasing the area of desert or arid country. The second is the influence of the dry north-east wind, which as the Sahara encroaches becomes a more powerful agent of desiccation than it would otherwise be. The third factor, a very powerful and detrimental one, is the native custom of setting fire to the grass. These fires

frequently spread to the forests and effect enormous damage. The fourth factor is the constant encroachment upon forest areas for purposes of agriculture, and the destruction of the trees by natives. Effective legislation and supervision would do much to prevent this damage.

In other parts of Africa there are very large forest areas. In the Kenya Colony, for example, it is estimated that there are some 3600 square miles of commercial timber, which although not large when compared with the size of the colony is nevertheless a good supply, if well conserved, for local uses, and as it includes a considerable bamboo forest, there is a possibility of exports for the manufacture of paper. The principal forests, however, are on the slopes of mountains, such as Mount Kenya, at considerable distances from railways and the difficulty and cost of transporting timber to the coast will always militate against a profitable export industry. In one respect, however, the Kenya Colony has a very valuable forest product, as the East African cedar (*Juniperus procera*) offers an excellent substitute for the American pencil cedar and may well become the chief source of the world's supply of this commodity. It is, therefore, an asset of considerable importance. In Uganda the forest areas are not large, the main source of supply being the Minzira forest near the Tanganyika boundary, the Nambigiruwa forest near Entebbe, and the Budonga forest in Bunyoro; but the Uganda forests have not been thoroughly explored. There are large supplies of podocarpus on the slopes of Ruwenzori.

Australia and New Zealand.—It is probably in Australia and New Zealand that the greatest damage proportionately to the existing supplies has been done to the timber resources of the Empire, and the former is probably the country that can least afford to waste its forests. Queensland contains as much timber as any portion of Australia, as it is estimated that there are 60,000 square miles of forest land, fully 10,000 of which contain good commercial woods. It is here, however, that very great waste has taken place and it is estimated that the forests are being overcut to the extent of more than double the increment. Of the softwood timbers the Hoop and Bunya pines are plentiful, but in the neighbouring State of New South Wales, with some

17,000 square miles of forests, the pines will be exhausted in about 12 years. The hard wood forests, predominatingly eucalyptus, which are adapted to a wide range of conditions, can apparently maintain their present supply both in Queensland and New South Wales, under careful management; but this is not the case in Western Australia where the felling largely exceeds the growth of the forests and where the large resources of jarrah, a very hard and excellent timber ranking higher than karri, another very close and durable wood, are being rapidly exhausted. Considerable quantities of these hardwoods are exported from Australia, but the Commonwealth imports much more timber than she exports, the values being £5,208,000 against £1,421,000 in 1920-21. This is, of course, a very serious position for a new country like the Commonwealth and the planting of timber on a large scale will have to be undertaken unless Australia is to become more and more dependent upon the rapidly contracting outside sources of supply. In the case of New Zealand, on the other hand, the local production is more than sufficient to counterbalance the considerable imports that take place as the exports are nearly twice the value of the imports; but the dwindling forest resources necessitated the introduction of a progressive forest policy in 1919, in order to counteract in some measure the great reductions that have taken place. New Zealand possesses a very valuable timber in her kauri pine, which is one of the largest timber-yielding trees in the world; but the reckless clearing of the forests that has taken place has reduced the supply enormously, and it is estimated that these forests will disappear completely in less than thirty years if the present rate of cutting is persisted in. The area of the New Zealand forests is estimated to be 16,000 square miles, but only a little over 2000 square miles are stated to contain really good merchantable timber.

Other supplies.—Finally, three other portions of the British Empire contain really extensive supplies of timber. These are Newfoundland, British Guiana, and British Honduras. In the first country the pulpwood industry is making great inroads on the supplies but no figures are available of the total area—which is roughly estimated at 10,000 square miles—or of the length of time before

these resources will be exhausted. In the case of British Guiana, with an estimated 77,000 square miles of forests, of which 13,000 square miles are at present workable, there is every reason to believe that the British Empire possesses one of its most valuable sources of timber. The British Guiana forests contain a number of excellent hardwoods, including a timber known as green-heart, unequalled for its flexibility and strength. British Honduras also contains large forests, including fine mahogany; but at present transport is the main difficulty in making use of the timber, although considerable quantities of mahogany have been exported for many years.

Pulpwood.—Before concluding this section something should be said about the pulpwood industry which is making such disastrous inroads upon the timber resources of certain parts of the British Empire. It is not generally realised how great a toll is taken from the world's forests for the production of paper and how necessary it is that every other available source of paper-materials should be experimented upon and requisitioned in order to mitigate this incessant demand upon our forest resources. Fortunately the trees suitable for pulp are limited to conifers and poplars, and these trees are practically confined to regions with a temperate climate. In the case of Canada the industry is mainly developed in the Maritime Provinces, Quebec, and Ontario, and already the stunted woods in the north—which take a century to reach the small size suitable for pulping—have been placed under toll. In Quebec, for example, damage has been done to enormous tracts of good forest which will take many years to recover, and the pulpwood has now to be brought over considerable distances and at great expense before it can be prepared in the mills. On the Pacific coasts there are still very large virgin supplies, but unless rigorous supervision is insisted upon the same ruthless extermination will take place. The life of many generations is not long enough, of course, to replace the giants of the forest, sometimes from 250 to 300 years old, which are now being felled in British Columbia, and future generations will have to rely upon timber of very much younger growth. The lessened cost in the shipment of British Columbian timber owing to the construction

of the Panama Canal, will certainly tend to the more rapid extension of the industry. Already the annual value of production has reached £7,000,000 per annum, of which by far the greatest amount is provided by the well-known Douglas fir or Oregon pine and red cedar. So far as the pulp industry is concerned, mills for the conversion of the wood into paper are likely to increase in number owing to the regulations under which the pulpwood must not be exported in an unmanufactured state. Numerous mills are already established, the most important being the Whalen Pulp and Paper Mills, which employ over 2500 men.

In addition to the British and other markets the enormous demands for pulp from the United States are already creating a great drain upon the Canadian resources and the time is not far distant when these demands will have outstripped the available supplies. Long before that period, however, almost irreparable damage will have been done to enormous areas of forest country—resources that are being recklessly squandered for the benefit of the present generation. The untimely destruction of our Imperial forests is a scandal of the greatest magnitude, and unless absolutely effective steps be taken to regulate this prodigal waste of our natural heritage, mankind will suffer in the future not only from a complete shortage of supplies but probably from climatic changes that at present can only be dimly foreseen but which, nevertheless, may have a profound and disastrous effect upon rainfall and humidity. Forest reserves should be established in every country in the empire, cutting of timber should only be permitted with the approbation of forestry experts, and, above all, afforestation should proceed simultaneously with the destruction of the full-grown timber.

CHAPTER IX

SUGAR

IN a previous chapter some attention has been devoted to the question of preferential tariffs and sugar and to the ruin that attended the sugar industry in the British West Indies as a result of the abolition of the differential duties, the competition of slave-grown sugar, the subsequent growth of the beet-sugar industry, and the granting of bounties in foreign countries. It is proposed in this chapter to describe briefly the present position with regard to empire-grown sugar, and to indicate the principal possible sources of supply. Ever since sugar became a commodity of commerce in the United Kingdom, it has been a political and fiscal question of the first magnitude in which the difficulties connected with it have never been satisfactorily adjusted, while political or economic disaster has generally followed attempts to settle the problem. Mr. Chamberlain's efforts to re-establish the old-time West Indian sugar industry upon a secure basis, met with some success, but the uncertainties of the position with regard to tariffs and with respect to a definite continuity in policy have been detrimental factors as serious as the present American attempt to secure control of the world's sugar supplies.

The position at the opening of the war was not sufficiently assured to ensure confidence in the future of the industry, but the events of the war and the alarming dependence of Great Britain upon outside sources of supply, coupled with the difficulty of getting sugar to this country, led to a careful examination of the whole question and to steps being taken to encourage the growth of sugar within the empire, and to place the industry upon a more satisfactory economic basis. It is particularly unfortunate, however, that even now, in spite of the numerous lessons and warnings of the past, almost the same uncertainty prevails with regard to the political

and economic future of sugar, and that although substantial progress has been made in the production of empire-grown sugar, the United Kingdom is still very largely dependent upon foreign sources for this most important, and essential, article of commerce. The statement on behalf of the British Government at the Economic Conference that the present preference would remain in force for a definite period of years has done something to stabilise the industry, but the general position is still far from satisfactory.

In the season 1913-14 the world's crop of sugar was approximately 18,812,000 tons. Of this quantity European countries furnished about 8,267,000 tons of beet sugar, the rest being largely cane sugar grown in the United States, Cuba, the Guianas, the British West Indies, India, Java, the islands in the Indian and Pacific oceans (Mauritius, Réunion, Philippines, Formosa, and Fiji), Natal, Egypt, and Queensland, with smaller quantities of beet sugar from the United States and Canada. During the war the beet-sugar industry of the Continent was greatly reduced, so that the output decreased by fully 4,550,000 tons, with the result that, in spite of a large increase in the production of cane, there is still a world shortage of some 2,000,000 tons on the pre-war figures. The enormous reduction in the output of European beet sugar gave America an opportunity of fostering and extending the sugar industry in Cuba where the output has nearly doubled since 1913, when 2,597,000 tons were produced against about 4,000,000 tons in 1920-21. American capital and American enterprise were engaged in extending by every possible means the growth of sugar in Cuba. With a free market in the United States there was every opportunity to build up a great sugar industry to the immediate detriment of the British West Indian sugar, with its restricted markets; so that while Cuba flourishes as one of the great centres of sugar production, furnishing nearly a quarter of the world's supplies, the neighbouring British islands equally suitable for sugar and capable of producing as large a supply, have only increased their output by about a quarter, and are still slowly recovering from the disastrous setback and adverse economic conditions under which they have laboured for so many years. While the United States was admitting

sugar from Hawaii, Porto Rico, and the Philippines free, and was granting a 20 per cent. preference to Cuban sugar, and has thus been building up a great industry in her colonial and political satellites, she has also been establishing a more or less direct economic control over the available sources of supply, so that at the present time she controls some 6,500,000 tons out of the world's output. The vast fusion of sugar interests recently brought about in the United States, including refiners and producers, is part of a plan to bring into line the whole of the American sugar interests so as to promote an export trade in refined sugar in order to make a determined attack upon the British market and those of the Dominions and Colonies. In the face of these manœuvres it is more than ever essential that every possible encouragement should be given to the extension of sugar-growing in the British Empire, as when once the local American markets have been supplied, sugar will probably be sold at prices under the cost at which it can be produced within the empire. Without expressing any opinion as to whether an increased preference within the United Kingdom does or does not increase prices to the consumer, it is tolerably clear that without such a preference it will not be possible to establish upon an unassailable basis an empire sugar industry capable of supplying the needs of Great Britain and rendering this country independent of foreign supplies. The arguments for and against are well known, but while it is certain that cheap sugar is eminently desirable, such sugar may be purchased at too great a price, owing to the indirect loss of colonial markets capable of purchasing the manufactured products of Great Britain in exchange for supplies of raw sugar.

It is unnecessary here to consider in detail the position that arose during the war. It is sufficient to state that it became essential at an early period to control the purchase and distribution of sugar, that soaring prices compelled the Government to buy in a dear market, and then to sell on a falling one, and that the total deficit on the trading operations of the Sugar Commission was something like £24,500,000. This enormous loss, if it had been distributed over a number of years in the form of preferences to colonial sugar, would have placed

the industry upon a satisfactory and permanent basis, would have enabled sugar to be purchased in British markets instead of being obtained from foreign sources, and would have retained within the British Empire much of the enormous sums at present expended on the purchase of foreign sugar. It has been established that during three years of the war, the drain in gold paid for foreign sugar was little short of £80,000,000, the whole of which might have remained within the empire.

By the introduction of a small measure of preference by which empire-grown sugar is imported into Great Britain at five-sixths of the full rate, a small but satisfactory increase has been achieved in the amount of British sugar imported into the United Kingdom; but it is as yet too early to estimate either the direct or the indirect effects in keeping plantations going and in increasing their output. The actual increase in production is not large when compared with the possible output and it cannot rightly be said that an increase from 3,273,000 tons produced within the empire in 1913-14 to 3,356,000 tons in 1920-21, is any argument in favour of a preferential tariff. It is, nevertheless, satisfactory to notice that the increase in importations of refined and unrefined sugar from within the British Empire has been maintained, the position being as follows in the years 1913, 1919, 1920, and 1921:—

COUNTRY.	1913.	1919.	1920.	1921.
	Tons	Tons	Tons	Tons
South Africa ..	28	10,900	12,600	54,000
Mauritius. . .	20,200	178,000	139,000	185,000
British India ..	3,800	4,700	16,000	1,400
Hong Kong ..	2	5,000	850	—
Australia ..	—	84	50	50
Canada ..	60	52,000	1,650	33,000
West Indies ..	29,000	92,000	106,000	69,000
British Guiana ..	18,000	20,000	18,000	40,000
	71,090	362,684	294,150	382,450

The empire's share of sugar is only about 30 per cent. of the total imported and it remains to be seen in what portions of the empire it may be possible to remedy

this alarming deficiency, either by increased production or by finding new areas of supply. Before doing this, however, it will be well to examine whether the United Kingdom herself cannot supply, from home-grown beet, a considerable portion of the sugar consumed. The fact that previous to the war, enormous quantities of beet-sugar came from Germany, Austria-Hungary, and other Continental countries led to experiments in the growing of sugar-beet in this country. That they were not economically successful was due to the strangle-hold of the foreign industry and not to any inherent superiority of foreign beet, although, of course, methods of cultivation and production, superiority of organisation, and lowness of wages were a predominating factor militating against the success of a British beet industry. If, however, beet sugar can be grown successfully in Canada and sent across the sea to Great Britain at prices that pay the producer, it is certain that beet sugar can also be produced economically in this country, when once the industry has been firmly established, the necessary lessons learned, and the factories built. Mr. Saxon Mills, an authority on this question, assisted in the establishment of a beet-sugar industry in the county of Hereford, and as a result of that experience, became convinced that there are large tracts in England exceptionally adapted to the crop and that the soil and climate are as well suited as those of Austria and Germany. It is evident that the economic loss to the United Kingdom in not growing this crop is very large. At a rough estimate it may be computed that a million tons of beet-sugar could be produced in Great Britain, which would require some three hundred factories representing a capital of £30,000,000, supplying work for over 100,000 persons, and creating and stimulating subsidiary industries without number. The only essential is a certain amount of fiscal nursing in the preliminary stages of the industry, trained experts to supervise the growth and production of the sugar, and sufficient faith in the permanence of the industry to induce capitalists to sink their money in the enterprise.

West Indies.—The most important sources of exported sugar in the British Empire are the West Indies, British Guiana, and Mauritius. It is grown in practically all

the West Indian islands, into which it was introduced, it is believed, from India, as it was unknown there three hundred and fifty years ago. The cultivation of sugar by means of imported slave-labour soon became the principal industry of the islands and rendered them so prosperous in the eighteenth century that the West Indian colonies were regarded as a far more valuable possession than the practically unpeopled wastes of Canada, and were economically as important as the great Indian empire then falling successively under British domination. At the opening of the nineteenth century the production of sugar from the West Indies, exclusive of British Guiana, was over 170,000 tons. In the year 1913-14, it was approximately 126,000 tons with an additional 105,000 tons from British Guiana. In a return, prepared for the West India Committee in 1915, estimating the capacity of sugar production within the empire, it was estimated that the production could be increased as follows :—

COUNTRY.	APPROXIMATE CROP. Tons	POSSIBLE CROP. Tons
Barbados	35,000	51,000
British Guiana ..	105,000	2,500,000
Jamaica	15,000	35,000
Trinidad	50,000	87,000
Windward and Lee- ward Islands ..	26,000	67,000
Mauritius	244,000	305,000
Fiji	97,000	164,000
Kenya	—	500,000
Queensland	217,000	500,000
Natal	91,000	332,000
	<hr/> 880,000	<hr/> 4,541,000

It will be seen that even within the countries then producing sugar there was an enormous field for expansion, although some of the estimates (*e.g.*, British Guiana), connote a very large increase in the supply of labour. Moreover, many other parts of our tropical empire could produce sugar, and the Indian crop might be largely extended by the application of modern methods.

An important aspect of the sugar question in the West Indies is the increasing demand from the Dominion of Canada for West Indian sugar. This has been fostered by preferential treatment in the Canadian markets, and there can be no doubt that the Dominion is looking more and more to the islands for many of the tropical products that are consumed by her people, while the West Indies are coming to regard Canada as a market of the greatest potential value. In 1918 Canada imported 382,000 tons of raw sugar—a total much greater than that grown in the West Indies—and imported products from the British West Indies to the value of nearly £3,500,000. This is naturally a market of the utmost importance to the West Indies, and it is interesting to notice that 55 per cent. of Jamaica sugar and 50 per cent. of British Guiana sugar were sent to Canada in 1921. Enormous areas of land in the latter colony are available for sugar cultivation and Demerara sugar has long been famous in the British market. At present some 63,000 acres are under cultivation, but with the introduction of more Indian labour, it is hoped to increase largely this area.

Mauritius.—Mauritius as an exporter of sugar has long held an important and privileged position. The interests of the colony are bound up with the industry and practically the whole land suitable for sugar-cane is put under the crop. At present over one-third (179,000 acres), of the island is under cane and the average production for the past five years has been nearly 250,000 tons. The factories are highly organised, in most cases with the latest equipment; and the labour employed, both in the factories and on the plantations, is almost exclusively supplied by Indians, who form over two-thirds of the population. Mauritius supplies its sugar almost exclusively to British countries—the United Kingdom, India, and South Africa—and a considerable portion of the sugar is refined before export.

Australia.—In Australia the cane-sugar industry is at present confined to Queensland, where in the year 1918-19, 307,000 tons of sugar were produced. That year, however, was one of exceptional production, the total for the year 1920-21 being 167,000 tons. The whole of this amount is consumed within the Commonwealth and in addition some 112,000 tons are imported. It is therefore

evident that Australia has considerable leeway to make up before she can be self-supporting and still further progress must be made before there is any surplus for export. The position is complicated, however, by economic factors which, unless the cost of production is lowered, will render export, should there be a surplus, unlikely. The Queensland sugar industry which was built up upon coloured labour, chiefly imported from the Pacific islands, is now almost entirely worked by white labour in accordance with the settled policy of the Commonwealth to preserve a White Australia. It is not intended here to criticise this policy, but it should be stated that very serious complaints have been made that the bolstering up of the Queensland sugar-growers in the interests of a White Australia is becoming ruinous to certain other industries. It has been stated that the high cost of sugar is tending to reduce the manufacture and consumption of jams, upon which the fruit industry largely depends, and one authority has estimated that the imposition of £6 a ton on imported sugar has taxed the Australians to the extent of £1,680,000 a year, or for the twenty-one years since its inception, £35,280,000. Recently this duty has been increased to £9 6s. 8d. a ton, and Australian jam makers who have lost a large part of their export trade are directly affected by this increase in duty. There is, however, another side to this important question. The unrestricted import of sugar into the Commonwealth would undoubtedly bring ruin to a great part of Queensland, and as the sugar industry furnishes at present almost the only practicable channel for increased settlement in the north-eastern portion of the continent, it is, therefore, of direct strategic and political value, as Australia can only hope to hold her northern areas in the future by means of effective settlement. Moreover, the internal price of sugar in Australia—at any rate during the war—compared favourably with the price paid elsewhere, and if Australia had then had to import her sugar the abnormal price she would have had to pay would have been at least equal to the tax on imported sugar since its inception. The value of the raw sugar produced in Australia was about £9,000,000 in 1921, a sum equal to three-fourths of the revenue of Queensland in the same period. In addition to cane,

sugar beet is grown in small quantities in Victoria, and it is suggested that the extension of this industry might give an additional and perhaps cheaper supply for the Australian jam factories.

Other areas.—In addition to Fiji, where sugar is one of the most important crops, sugar is being grown in Kenya and Uganda, while in Natal it has long been an important industry. The rich alluvial lands in the deltas of the rivers and along the coasts are specially suitable for sugar in Kenya, while in the neighbourhood of Lake Victoria is another rich area, which is now being developed by the Victoria Nyanza Sugar Company. The sugar industry in Uganda is at present hampered by the heavy freights to the coast but it has been proved that the sugar produced is of an excellent type. In South Africa the growing of sugar is practically confined to Natal in the belt of tropical country along the coast. The area is large, extending northwards from Port Shepstone into Zululand, which is the best district. The output is considerable and in addition to the local market there has been a large and increasing export to Great Britain during the last three years. In 1921 over 50,000 tons were exported and this result is largely attributable to the confidence of South African growers in the security of the British market.

In the case of India, where a Committee of Inquiry has reported that the methods of cultivation and production might be greatly improved, there is a larger area under sugar than in any other country in the world. The production, however, is insufficient to meet the local demands and although there is a small export of raw sugar there is also a considerable importation. Before the war India was importing no less than 900,000 tons of sugar per annum, but increased production within India has greatly lessened this enormous amount. The total production of Indian sugar in 1920-21 was 2,349,000 tons. A very large part of this is produced by small growers, and disposed of in an unworked form so that India is still dependent upon outside sources for the better forms of sugar.

CHAPTER X

COTTON AND OTHER FIBRES

COMPARATIVELY few people outside Lancashire recognise the immense importance of the British cotton industry, and fewer still realise that prior to the war our exports of cotton goods represented nearly one-third of the value of our total trade in manufactured articles. The growth of the cotton industry in Lancashire represents one of those exotic trades which, owing to the industrial revolution and the introduction of the factory system, took such a firm hold in the United Kingdom. It was equally possible, of course, for the industry to have been established elsewhere, and this has actually become the case, since of the spindles employed in the industry in the year 1912-13, only some 18.6 per cent. were at work in Great Britain, the rest being distributed in America and other countries, and, within the British Empire, in India (9.5 per cent.), and Canada (0.5 per cent.). Great Britain, therefore, has, in reality, only a share—a considerable share, it is true—in the world's spinning of cotton, but there is no reason why this share should not be diminished in the future as the manufacture of cotton becomes better established in other countries, such, for example, as India, where during the last twenty years the number of spindles has more than doubled. Lancashire has not any inherent superiority over other countries except in so far as the inventive genius of the people, the skill of the operatives, and the organising enterprise of the masters are able to maintain, and extend, an industry upon which their livelihood depends. The most serious danger, however, which threatens the British industry is not the extension of spinning elsewhere, but the possible world-shortage of cotton, and the fact that the British Empire is mainly dependent for its supplies of the raw material upon foreign countries and principally upon the United States of America. Out of 21,742,000 centals (of

100 lbs.) imported into the United Kingdom in 1913, over 15,847,000 came from America, and only 719,000 from countries within the British Empire, exclusive of Egypt. Similarly in 1920, 13,950,000 centals came from America out of 19,026,000 imported, and only 1,095,000 were grown within the British Empire, again exclusive of Egypt. But the predominating and most alarming feature of the position is the fact that while the demands for cotton and cotton materials are continuously increasing with the growth of the population and new uses for cotton are constantly being found, such as, for example, webbing for motor-car tyres, aeroplane wings, and typewriter ribbons; the actual world's production has shown a decrease within recent years, in spite of all the efforts that have been made to increase the supplies. A disastrous year in the United States might well produce a cotton famine, which would have far-reaching effects in Lancashire, and bring about a partial or even total cessation of the industry. It is possible that had the duty imposed at one time on foreign cotton and the consequent preference accorded to cotton grown within the empire been retained, the position of the United Kingdom with regard to its supplies of raw cotton would have been very different. This, however, is a matter of ancient history and acute controversy.

The actual position with regard to the production of cotton is approximately as follows. During the five years from 1909-1913 the total annual growth was estimated to be 8,910,000,000 pounds, whereas from 1919 to 1921 it was only 8,124,000,000 pounds, indicating a decline of about 5 per cent. in the actual production of the raw material.

The situation which has faced the manufacturers of Lancashire is, therefore, one of the most serious that can be imagined; but the ravages of the boll weevil, especially in the United States, and the increase in cotton mills in other lands, combined with the constant labours of the British Cotton Growing Association to educate public opinion in this matter, have at length awakened the British Government to the danger of the position, and to the necessity for taking effective steps to secure from within the British Empire an adequate, and constant, supply of raw cotton. Up to the present only the carry-over

from a previous good year has enabled the industry to be kept going, but even this stand-by might fail, in a time of general scarcity, and it is, therefore, of paramount importance that every potential source of empire-grown cotton should be exploited.

Simultaneously with the realisation in Great Britain that there was a danger of a cotton famine, the question of increasing and improving cotton production in every practicable direction was discussed and steps taken to investigate the sources of supply. At the World's Cotton Conference held at New Orleans in October, 1919, a demand was made for statistics covering the whole industry and suggestions were put forward for improving and extending the supply. With the efforts made by other countries, we are not immediately concerned, and it need only be said here that the financial support accorded by the Government to the British Cotton Growing Association has enabled very valuable investigations to be made and practical work to be undertaken, and that with the subsequent creation of the Empire Cotton Growing Committee (later Corporation), which was appointed in 1917, to inquire into the possibilities of cotton production within the empire, steps have been taken which will encourage the development of a great cotton growing industry and will enable the United Kingdom, it is to be hoped, in the not distant future, to become independent of outside sources of supply. At present the American crop dominates the market, but with the extension of cotton areas in West Africa, the Sudan, Uganda, Queensland, and other parts of the empire, the position may become radically altered and the Lancashire industry placed upon a self-supporting basis.

In the year 1920, the main sources of raw cotton within the empire were, in their order of importance, India, Uganda, the Anglo-Egyptian Sudan, the British West Indies, Nigeria, Nyasaland, Natal, and the Kenya Colony. Egypt was, of course, an important contributor, but for the purpose of this survey may be left out of consideration. Since that date important developments have taken place in Queensland, but on the whole the position has not materially changed since the bumper year 1920, when cotton to the value of upwards of £253,358,000 was imported into the United Kingdom, of

which amount only £9,546,000 came from within the empire exclusive of Egypt, the great producer of the long-staple variety. The chief potential sources of cotton within the empire are the Anglo-Egyptian Sudan, Uganda, Nigeria, Australia (and especially Queensland), and Nyasaland.

In the case of the Anglo-Egyptian Sudan the area under cotton had a set-back in 1921-22, when less cotton was planted than in the previous year. The total output was 9,423,000 lbs., and the cotton is chiefly grown in the Tokar district near the Red Sea, around Berber on the main Sudan railway, in the inland delta of the river Gash and elsewhere in the Kassala province, and in other localities south of Khartoum, including the well-known Gezira plain. At Tokar the cultivation is on land annually flooded by the river Barraka, while the irrigable land along the river Gash, where the river fans out and floods an area of great fertility that has been built up by its silt-laden waters, before they finally lose themselves in the sand, forms a region capable of great extension, which will be joined by railway communication with the line running to Port Sudan. The export of cotton from the Sudan, although it has increased considerably since 1912, is still comparatively small when compared with the possible area of cultivation, which will doubtless be greatly extended when the various irrigation schemes under construction or consideration are completed. Cotton has been grown in the Sudan for centuries, both for domestic use and for export, and at one time Sudanese cotton and cotton goods had a great reputation throughout northern Africa. Experimental farms have been started and it has now been thoroughly proved that the Sudan native can grow good cotton and, under irrigation, long-stapled cotton equal to the Egyptian variety. American cotton, which reaches maturity more quickly than Egyptian cotton, can be grown over wide areas dependent upon the rainfall, and experiments have been undertaken to establish the advisability of greatly extending the cultivation of this type, more especially in the Tokar district; although it is stated that the valley of the Gash promises to have a much brighter future, as besides that river having a greater discharge than the Barraka, the climate is much more agreeable. In the

Gezira, the great district between the Blue and White Niles, the barrage (with the necessary distribution canals for irrigation), that is being constructed at Makwar near Sennar, which will be completed in 1925, is estimated to render some 1,000,000 acres fertile, of which it is proposed to place about one-third under cotton.¹ At the present time only about 70,000 acres are devoted to cotton in the Sudan, and this extension, together with other schemes, should bring the period nearer when the estimated output of one million bales may be possible. The great superiority of the Sudan is shown in the fact that whereas in India the production is about one bale to two acres and in America (where it used to be about the same) about one bale to four acres, in the Anglo-Egyptian Sudan, one bale is produced to the acre. With regard to the southern portions of the Sudan, any estimate of the possibilities of cotton production is at present entirely speculative as developments depend not only on the irrigation policy that may be adopted, but also upon the provision of adequate means of transport. At present the White Nile is kept open only with difficulty, but as explained on p. 41, a policy of rendering this great waterway really useful for traffic, through the Sudan and from Uganda, would work wonders.

Turning to West Africa, another great potential source of cotton, there can be no doubt that Nigeria might produce an annual minimum of a million and a half bales. Unlike the Sudan, where labour is not too plentiful, there is an abundant supply of man-power among the 17,000,000 natives of Nigeria. Moreover, the natives are used to individual cultivation: that is, they are willing and anxious to develop and own their own farms and plantations—a policy that has been encouraged in all the West African colonies. In Nigeria, however, the great stumbling-block is the cost of transport to the coast and the need for the extension of the Lagos-Kano railway north-eastwards to the rich cotton lands around Lake Chad and north-westwards from Zaria to Sokoto, which would open up a most important and promising cotton-growing district. The policy of the railway authorities does not appear to be sufficiently progressive in the matter of cheap rates of transport, and serious complaints

¹ Report of the Empire Cotton Growing Committee (Cmd. 523). 1920.

have been made by the mercantile community regarding the cost of railing cotton and other products to the coast. The great object of a Government railway is, of course, to open and develop a country and not to bring in large sums of money to the Government. It is, therefore, essential in the case of Nigeria that the railway rates should be as low as possible, even if the railways do not earn sufficient to pay interest on the cost of construction. In Nigeria, for example, the proportion of expenses to receipts has continuously decreased until in 1917 it was only 53.73 per cent., leaving a very handsome margin for payment of interest (6.83 per cent.). Since 1917, the net returns of the railways have greatly decreased, but there is still a considerable balance on the right side, the railways earning (1921-22) sufficient to secure a 2.59 per cent. on capital expenditure. This railway problem is one of the most important factors, and it may well be doubted whether it is really a wise policy to run such a railway for the purpose of making money before the country is thoroughly organised from the agricultural and industrial point of view. In spite of these drawbacks, however, cotton has made considerable progress in Nigeria, because in addition to the great local consumption of the raw material there was an export of 29,000 bales in 1920-21, of which about one-fifth represented the exotic American cotton. It is stated that the improved cotton of the nothern areas is of excellent quality, distinctly superior to the bulk of the American crop, but the yield per acre is small. With regard to Nigeria, it is worth while recalling the opinion of Sir Hector Duff in his report to the Empire Cotton Growing Corporation (1921). Nigeria, he states, is a peculiarly promising region, possessing as it does enormous areas suitable for cotton, a sympathetic government, intelligent native chiefs, a dense population, peaceable internal conditions, and seaports within a comparatively short distance of Europe. The question of cost in relation to internal transport is, he continued, a very serious one on the low grade indigenous cotton, but for Allen's improved or other fine qualities transport outlay is not an insuperable obstacle. As illustrating this point Sir Hector Duff instances the Bauchi line of railway which was built not with a view for cotton, but has greatly

developed its growth all along the suitable portions of the line.

Turning to other parts of West Africa the possibilities do not appear to be so favourable. The Gambia Colony, where cotton could be extensively grown, is given over to the cultivation of ground-nuts, and the population is too small for the creation of a cotton industry. In the Gold Coast a certain amount of cotton is produced, mainly for native consumption, and the exports vary considerably. Its cultivation is, in any case, alternative to cocoa, which has generally been more profitable. Nevertheless, when prices are high, as in 1916-17, an export of 44,000 lbs. has been reached. The outer northern boundary of the dense forest region and the Krepi country east of the Volta are the only two parts in which cotton is systematically cultivated and hitherto attempts to extend the industry to the northern territory have not met with much success. In Sierra Leone great hopes were at one time entertained of a considerable extension of the cotton growing industry, but the heavy rainfall (150-180 inches per annum) and local inefficiency rendered efforts to establish an exporting industry unsuccessful. In Togoland the Germans were endeavouring to establish cotton-growing on an exportable basis, and in 1908-9, about 2300 bales were exported. In the French portion these experiments have been continued with better results, but in the small part administered by Great Britain only a very small export has been achieved, some 781,000 lbs. in 1920. Similarly, in the Cameroons the Germans were experimenting with cotton, but it is doubtful whether any portion of the British territory, except in the immediate neighbourhood of Lake Chad, will be found to be suitable. Here the soil and the climatic conditions are favourable, but nothing can be done until the Lagos-Kano railway is extended to the Lake.

On the other side of Africa small quantities of cotton are grown in Kenya, chiefly on experimental farms where American upland seed has been employed, and in the Tana and Juba valleys, where Egyptian seed is grown under irrigation. The quantity grown by Europeans is, however, small and exports have not exceeded 378,000 lbs. (1920-21), although a considerable amount of cotton is cultivated by natives in the Kavirondo country; and

it is not expected that Kenya will ever become a great cotton growing area, like the neighbouring colony of Uganda. There the crop is grown almost entirely by thousands of native cultivators, a large number of ginneries are at work, and the cotton is derived from two varieties of the American upland. Practically the whole crop is exported, and in 1921 the exports reached the large total of 38,547,000 lbs., which in itself is only a small amount of the quantity that can be produced in the country. As the industry has to bear the cost of the long haulage to the coast at Mombasa, over the railway from Port Florence on Lake Victoria, and, in most cases over the Busoga railway and Lake Victoria in addition, this is a highly satisfactory result demonstrating that the empire possesses a large cotton reserve in this portion of Central Africa. At present the chief cotton districts are in the Eastern Province, but the Mengo district of Buganda, situated between Lake Victoria and the Nile, has also a considerable area under cultivation. Although it is certain that Uganda can produce very large quantities of cotton it is by no means as certain that native growers can always procure purchasers for their product. During 1920, for example, when owing to the high prices of the previous season there was a great increase in the area under cultivation, there was a considerable difficulty in selling the crop, and a scheme of Government buying had to be introduced in order to dispose of it at the low prices prevailing in the European markets. Consequently the natives were discouraged and a reduction in the area under cultivation is anticipated. It is evident that unless some scheme can be devised whereby empire-grown cotton shall have a preference in the British markets over American cotton, and buyers can be induced to consume the empire-grown crops, the Lancashire manufacturers may find themselves left in the lurch at a period of scarcity, as it is little use for native growers to plant, unless they can be assured of a ready and constant demand for their produce.¹ This remark applies to all the new cotton growing communities within the British Empire: their difficulty is to establish a constant and, so far as consumption is concerned, unchanging market.

¹ It is interesting to notice that 63 per cent. of the Uganda crop went to India in 1921, and 35 per cent. in 1920.

The Tanganyika Territory is also another prospective cotton region, especially in the coastal areas and near Lake Victoria on the opposite side to Uganda. During the German occupation great efforts were made to extend the industry, and in 1913 some 6,600,000 lbs. of cotton were exported; the whole of the crop going to Germany. The export is now chiefly with Japan and in 1920-21 reached 1,148,000 lbs. Farther south and inland in the Nyasaland Protectorate there are great possibilities for cotton growing, and the extension of railway communication to Lake Nyasa and in the opposite direction to Beira will give a considerable impetus to the industry. The Nyasaland cotton, which has a longer staple than the American variety, is grown chiefly in the southern areas along the Shire River from Lake Nyasa to the Zambesi, and although exports have considerably decreased since the war (when they reached 3,462,000 lbs. in 1916-17), and are now only about 900,000 lbs., there is every possibility of their being considerably increased. Similarly the great territory of Rhodesia offers opportunities for the cultivation of cotton along the valley of the Zambesi and its tributaries, especially in North-Eastern and North-Western Rhodesia. Hitherto, however, very little cotton has been grown, but the exports are increasing, having been 7000 lbs. in 1918, and 40,000 lbs. in 1921. In the Union of South Africa cotton is grown on a small scale in many districts, including Rustenburg, Barberton, Natal, and Zululand, Swaziland, and the Transkei. In Swaziland, especially, there is an admirable cotton country, as the rainfall is sufficient for the crop, but the native population is not large. The total exports from the Union have reached over 1,000,000 lbs. of ginned cotton, but in 1922 they fell to 854,000 lbs.

With respect to Australia it will be found that many parts of the immense Commonwealth are suitable for the crop. The main difficulty, however, is not to produce cotton—which grows admirably in Queensland and in portions of the Northern Territory, Western Australia, and New South Wales—but to procure and maintain working at the industry a sufficient supply of labour. While prices remain high and it pays to produce the crop by white labour, there is not likely to be any

difficulty ; but when prices are low, it is as yet doubtful whether Australian cotton will be able to hold its own in any but purely local markets. Extraordinary interest has been taken in the re-establishment of the industry in Queensland, where the growing of cotton has proved remunerative and ginneries have been established through the agency of the Australian Cotton Growing Association. In 1922 about 7000 acres were under cotton in Queensland, producing a yield of 3,250,000 lbs., and it is expected that the output will be much greater in the future. It is too early as yet to state whether the industry can be regarded as a permanent one, but it is sufficiently proved that Australia is a possible source of empire-grown cotton, and that the only difficulty in the way of establishing a large industry is economic.

The position of the West Indies with regard to cotton is a peculiar and privileged one. The following table shows the quantity grown in the different islands in two contrasted years—the year of highest production and the year 1920-21 :—

ISLAND.	QUANTITIES IN LBS.	1920-21.
Antigua ..	240,000 (1913-14)	114,000
Barbados ..	455,000 (1911-12)	101,000 (1919-20)
Grenada ..	401,000 (1913)	329,000
Montserrat ..	548,000 (1919)	350,000
St. Kitts-Nevis	736,000 (1914-15)	772,000
St. Vincent ..	555,000 (1919-20)	652,000
Trinidad and Tobago ..	12,000 (1912)	49,000
Virgin Islands	29,000 (1915-16)	34,000 (1919-20)
		<hr/> 2,401,000

Practically the whole growth is exported and consists of what is known as Sea Island Cotton, although small quantities of a variety known as Marie Galante are grown in St. Vincent. The Sea Island Cotton is one of the most valuable varieties and was introduced from America. In the mainland colony of British Guiana, it is stated that there is an enormous area suitable for cotton, but practically none except native cotton is grown. In any

case sugar will probably have the preference, and as labour is limited no extension of cotton-growing can be looked for in the immediate future.

The position of India as a cotton producer has been left to the last because the Indian cotton is in a class by itself, and the bulk of the exports have in the past gone to Japan, Germany, Belgium, Italy, and Austria, where the manufacture of the coarser kinds of materials is more usual than in the United Kingdom. The Indian cotton is of shorter staple than the American or West Indian varieties; but owing to the increasing demand, long-stapled varieties are being grown and it is probable that there will be a considerable increase in the exports of Indian cotton to Liverpool. The question of the Indian cotton supply was considered by the Indian Cotton Committee which issued its report in 1919. This document is a most exhaustive survey of the position and should be carefully studied by all who are interested in the problem of extending the supplies of raw cotton within the Indian empire.

The exports of cotton average about one-third of the total value of the raw materials exported from India, and in connection with the world-shortage of cotton it is stated that no country offers such potentialities for making additional contributions to the crop. The problem is complicated, of course, by questions regarding the extent to which Indian short-stapled cotton can be utilised in Great Britain, and as to the extent to which the longer stapled varieties are likely to find favour in India. It is also conditioned by the possibility of improving the existing crops as well as by the extent to which the increasing local consumption will reduce the available exportable surplus. But there is no doubt that this surplus can and should be considerably increased by improvements effected both in the nature of the crop, and in the control of the trade. It is doubtful, however, how far it may be possible to introduce exotic cottons, as the experiments that have been made for many years have not been successful, and recently the Director of Agriculture in Bombay has reported that American cotton cannot be grown successfully, and that in the Punjab introductions have deteriorated in quality and yield. He states that the only course is to improve the plant

from within India by selection from the different types now growing.

The chief cotton producing areas in India in their order of importance are Bombay (inclusive of Sind), the Central Provinces and Berar, Madras (with its native States), Hyderabad, and the Punjab. In Sind and the Punjab the crop is almost entirely irrigated, but elsewhere it depends for the most part upon the sufficiency of the rainfall—an important factor which leads to wide variations between the crops in different years. Moreover, the yield per acre varies considerably in different parts of India since, for example, in the year 1918-19 Bombay with 6,150,000 acres under cotton produced 766,000 bales whereas the Central Provinces with only 4,211,000 acres actually yielded more, viz., 789,000 bales. The total value of the Indian crop in the last year before the war was nearly £50,000,000 and of this amount cotton to the value of about £27,361,000 was exported, only about 3.7 per cent. going to the United Kingdom.

Kapok.—Kapok or silk-cotton, which may be conveniently noticed here, is a soft fibre obtained from *Eriodendron anfractuosum*, much used for upholstery and bedding. Comparatively small quantities are imported into Great Britain, chiefly from Java, but India and the Straits Settlements, as well as Ceylon, New Zealand, and the Anglo-Egyptian Sudan are also sources of supply, especially the first. In India the internal trade has considerably increased but the quantity shipped is small.

Sisal.—Sisal or sisal-hemp is a fibre which is now being extensively grown in various parts of the empire on account of its excellence for cordage and binder-twine, bags, hammocks, and similar articles. Of the total amount of hard fibres imported into Great Britain, sisal represents only a comparatively small quantity, but the very high prices reached by this commodity during the war led to a remarkable increase of planting, and the supplies recently have been in excess of the demand. It can only be cultivated by Europeans where labour is plentiful and cheap and it does not pay the small grower, considerable capital and a large acreage being necessary. Sisal takes its name from the small port of Sisal in Yucatan, Mexico, but it differs from the sisal of Yucatan, which is generally known as henequen (or locally sacchi),

and is the produce of the *Agave elongata* whereas the variety (*Agave rigida sisalana*), grown in various parts of the British Empire is not the true henequen, but is stated to yield a fibre that is stronger, whiter, more flexible, and worth more.

The sisal grown within the empire is produced in the Bahamas, Turks and Caicos Islands, Kenya, Tanganyika, Nyasaland, Papua, Fiji, and Queensland. The plant grown in the Bahamas was at one time regarded as a weed but its cultivation was taken up seriously, and within two years after the first export (1892) its value reached £130,000 annually. Almost all the Bahamas sisal is sent to the United States and it ranks with providing American tourists with unlimited supplies of alcohol and the gathering of sponges as the chief industry of the island. In Kenya, where it was grown experimentally at Government House, Mombasa, in 1902 and at Nairobi in 1903, there are now large plantations both in the low-lying coastal districts and on the higher ground up to an altitude of 5500 feet. Numerous factories for the extraction of the fibre have been established and the exports increased from 1500 tons in 1913-14 to 6127 tons in 1920-21, valued at £192,000, produced from 30,000 acres under cultivation. In the neighbouring Tanganyika Territory the Germans, who sent their officers to Mexico and Florida to study the plant, were highly successful, the exports reaching 11,212 tons in 1911 and, during the British control, 16,663 tons in 1920.

In Australia there have been various attempts to make the growing of sisal a success. Queensland, and enormous tracts in Western Australia and the Northern Territory, are suitable for its growth, but the scarcity and expense of labour is a factor that cannot be easily overcome. In spite of a bounty of 10 per cent. only one payment of £2 was made and the bounty was finally withdrawn. Nevertheless, Australia may be regarded as a potential source of this fibre as well as Papua, both the late German portion and the Australian part, Fiji, where the production is still small, and South Africa, where it has been cultivated experimentally in Natal. Sisal is also grown in Nyasaland. With regard to India, where sisal is extensively cultivated along with other varieties of hemp, it is not possible to give any definite figures.

Hemp.—The hemp grown in India is the product of at least three important plants, *Cannabis sativa*, *Agave sisalana*, and *Crotalaria juncea*, but that chiefly exported and known generally as Sann Hemp is not the true hemp of commerce, which comes from *Cannabis sativa*. Nevertheless, for purposes of convenience all the hems are generally, classed together, and of the quantity exported to Great Britain in 1913 (137,000 tons), about one-third came from within the British Empire, the greater part of the remainder coming from the Philippine Islands, Russia, and Italy. The chief hemp exporters within the empire are New Zealand, India, Mauritius, and Kenya. In New Zealand it is obtained from the leaves of *Phormium tenax*, an indigenous plant first noticed by Captain Cook. The exports are considerable and reached 28,000 tons in 1913, valued at £721,000. In Mauritius the hemp is obtained from *Furcraea gigantea*, which has been introduced into many other countries, and is known as Mauritius hemp. Systematic cultivation has been undertaken, and in 1913, 2,867 tons were exported valued at £65,000. Another variety of hemp, obtained from *Sansevieria*, has a wide distribution in the West Indies, India, Ceylon, East Africa, Sierra Leone, and elsewhere, but is not extensively used.

Flax.—Flax, which is woven into linen fabrics, has been mentioned under linseed ; but as it is the foundation of our great linen industry, of which Belfast is the principal centre, and Dundee, Dunfermline, and Kirkcaldy are also important manufacturers, it should be mentioned that the fibre that is not actually grown in the United Kingdom came, previously to the war, chiefly from Russia (to the extent of about 88 per cent.). Recently the demand for flax has been met largely from home supplies (chiefly Irish), but it may be said that flax is being cultivated in Kenya, where in 1920-21 there were twenty-four thousand acres under cultivation, and in Canada. Elsewhere in the Empire, with the exception of India, where it is grown entirely for linseed, although flax could be cultivated in many parts, little attention has been given to the fibre, chiefly owing to the uncertainty of yield and price.

Jute.—Jute, which is chiefly used for coarse materials, cheap carpets, and other articles not requiring the finer

texture of cotton or linen, is a product that comes almost entirely from within the empire. India supplies practically the whole of the jute consumed in Great Britain, and in 1913 sent 347,000 tons, valued at £9,182,000, as compared with 216,000 tons, valued at £12,995,000, in 1920. The area devoted to jute in India is approximately 3,000,000 acres (2,821,000 acres in 1919), and the production about 1,500,000 tons, by far the greater part being grown in Bengal. Enormous quantities are shipped to the United States, France, Italy, and Spain, in addition to Great Britain, and larger quantities are manufactured in India itself, the mill consumption being about 1,000,000 tons of raw jute, and the value of manufactures £18,849,000 in 1913-14 and £35,101,000 in 1918-19. The jute industry, both agricultural and manufacturing, is one of the most important in India, and the practical monopoly of jute by India is an important factor in the economics of the British Empire. Attempts to establish jute elsewhere, particularly in West Africa, have not been very successful, chiefly for economic reasons; but there are numerous substitutes, and India only possesses a monopoly because the industry is highly organised and can withstand outside competition.

Other vegetable fibres.—It is not necessary to deal specifically with other important fibres, of which there are many growing wild in the British Empire, which might be successfully cultivated should the demand arise. Ramie, which chiefly comes from China, is one of the strongest fibres known and could be cultivated in many British colonies. An attempt is being made to introduce another fibre, to which has been given the name Arghan, which is closely allied to Colombian pita, if indeed it is not identical. It is claimed that this fibre has very excellent qualities and is of great length. Piassava is exported from West Africa, where it is abundant, and is used for brush-making; while zacatoot, another very coarse fibre, is also being experimented upon. Fibres and grasses have a very important commercial use in the manufacture of paper, and with the reduction of supplies of wood-pulp, mentioned on p. 144, they will be much more extensively used in the future. Esparto grass, which grows wild throughout French North Africa, and is imported into the United Kingdom in very large quantities

(204,000 tons in 1913, valued at £743,000) is one of these ; but there are numerous other raw paper materials within the British Empire, such as bamboo, baobab bark, megasse (the residue left after the extraction of sugar from the cane), the elephant grass of Uganda and other African countries, and the papyrus of the Sudan.

Silk.—Compared with other countries the silk industry in Great Britain is unimportant and is not so highly developed as the other branches of the textile industries. Its history should be of considerable interest to tariff reformers, as in foreign countries the industry has been built up and fostered by a system of tariffs which have been designed to protect and extend manufacture in every possible way, and have been directly successful in so doing ; whereas in the United Kingdom the abolition of the duty on silks, under the treaty with France in 1860, led to an immediate decline in silk spinning and the manufacture of silk goods. This was partly due to the fact that the industry can be extended more readily in countries where the rearing of silkworms is possible, so that the United Kingdom was at a considerable initial disadvantage. That high protective tariffs have been a most important factor, however, is shown by the fact that the United States, which imports her raw silk, has been able nevertheless to build up a most flourishing manufacturing industry, so important and extensive, that in the year 1921-22 she imported more than half of the world's output of raw silk and made and exported enormous quantities of silken materials.

During recent years there has been a very large increase in the demand for silk and silk goods, with the result that the world's output of raw silk has increased from 64,000,000 pounds in 1914 to 92,000,000 pounds in 1921. This very large production is consumed chiefly in the following countries, taking them in their pre-war order of importance : the United States (which imports about three times the amount of silk used in France), France, Germany, India, Switzerland, Russia, Italy, Austria, and England. With regard to the consumption of raw silk in Great Britain, only a very small proportion comes from within the British Empire, as out of some £620,000 worth imported in 1913, only about £17,000 worth was produced within the empire, mainly India,

but also to a small extent Ceylon and other eastern possessions. It is to be regretted that so small a quantity is produced within the empire, because the cultivation of raw silk was one of the great industries fostered in India by the East India Company and we ought to continue to draw our supplies from British territory. Even in the days of Warren Hastings, when the population of Europe was small, the Indian exports are believed to have averaged 500,000 lbs. per annum, whereas at the present time, in spite of very considerable efforts to resuscitate the industry, the exports of raw silk, chasam (silk waste), and cocoons, average not more than one million pounds annually, although during the decade ending in 1874 they were double that amount. Fortunately silk is not an industry vitally necessary to the empire, but its decline in India is nevertheless to be regretted because it is largely a peasant and cottage occupation, which is capable of very considerable expansion under proper guidance and encouragement, and is suited more especially to those classes of the community who are in the greatest need of a helping hand. Such encouragement has been forthcoming both from the government and from a body that is doing much to raise the submerged tenth of India in the scale of civilisation—the Salvation Army, which has been very active in preaching the desirability of extending the production of raw silk throughout the peninsula, and in fostering the creation of small centres of the industry.

The silk produced in India is of three principal kinds. The chief variety is that formed by the silkworm feeding upon the mulberry tree, which is extensively grown for this purpose in the Coimbatore district of Madras, in certain areas in Bengal, and in Kashmir. In the last State, which produces some 200,000 lbs. of reeled silk annually, the industry is a government monopoly. The second variety is the so-called tussore (properly tasar) silk, the product of a wild silkworm feeding on a species of laurel, and the third kind is the well-known eri silk, from which is produced the spun silk, as it cannot be reeled from the cocoon as is the case with the two former kinds. The eri silkworm feeds on the castor oil plant, and could thus be cultivated in those tropical parts of the Empire where labour is cheap and abundant.

In addition to real silk there is a growing demand

throughout the world for artificial silk of various kinds. Although this is not so strong or durable, it has a finer lustre, and is now in great demand for mixing with the real silk or for making various kinds of articles, ranging from imitation Smyrna rugs, silk sweaters, and "gobelins tapestry," to hosiery and cravats. It is estimated that, in spite of the war, the world's output of artificial silk has increased from 26,000,000 lbs. in 1914, to 44,000,000 lbs. in 1921, and there is every prospect, as methods of production from various materials are perfected, that this consumption will be very greatly increased. The industry has assumed great importance in Germany, France, the United States, Japan, Italy, Czecho-Slovakia (where very great progress has been made), and also in England. Its importance can be gauged by a consideration of the position in Canada, where the government is anxious to encourage the building of factories for the production of the silk in view of the fact that it is largely obtained from wood-pulp of which there is a plentiful supply in the Dominion. The suggestion is that the production of cellulose acetate yarns would become a most profitable industry, for in addition to the supplies of raw material there is a good market ready to hand, as Canada imported artificial silk yarn in the year 1922 to the value of about £400,000, more than half of this amount coming from Great Britain. In any case the extension of the artificial silk industry is assured both in Great Britain and elsewhere, but it is not at present possible to estimate either the character or the amount of the raw materials used in the industry. It can, however, be stated with confidence that much of this material can be produced within the empire and that with the extension of the industry there should be an increasing demand for raw materials derived from British sources.

CHAPTER XI

WOOL, SPICES, TOBACCO, DRUGS AND MEDICINES, DYES

DURING many centuries wool was "the flower and strength and revenue and blood of England," and the history of wool was virtually the history of English commerce. Far back in the mists of time the wool of Britain was famed beyond the confines of the British Isles, and during the Roman occupation the looms established at Winchester supplied the legions with their clothing. "The wool of Britain," it was stated, "is often spun so fine that it is in a manner comparable to the spider's thread." The present volume, which deals with the products of the empire, is not concerned, for obvious reasons of space, with the production of the United Kingdom. Although much might be said about the importance of wool in Great Britain, about the Acts of Parliament for the encouragement of the staple that were constantly being passed, about the uses to which it was put from the swathing of newborn babes to the wrapping of corpses for burial—the latter according to act of Parliament—and about the stringent regulations to discourage the enterprising foreigner from extending the industry on the Continent, such for example as branding on the hand any one who exported sheep from England, attention must be directed chiefly to the introduction into and progress of the industry in the British overseas possessions and the establishment of woollen industries in the Dominions.

With the rapid growth of commerce in England during and after the Napoleonic wars it became necessary to find additional sources for the supply of wool. At the beginning of the nineteenth century the native output was estimated at 86,000,000 lbs., but it was supplemented by the importation of about 8,000,000 lbs. from foreign sources, of which more than three-quarters came from

Spain. At that period wool was admitted free, but in the year 1802, a duty on imported wool was imposed. It was not until 1825 that colonial producers succeeded in obtaining a free market for their wool in Great Britain and they enjoyed this preference until 1844 when all wool was again admitted free. Under the preference the wool industries of Australia and South Africa were successfully developed and the immediate and practical result was that colonial imports increased from 351,000 lbs. in 1825, to 1,242,000 lbs. in 1826, and that thenceforward there was a steady advance in the amount of colonial wool. Spain was practically driven out of the market, and so firm a hold did the colonial wools obtain that the supply of sheep's wool from within the British Empire is to-day more than six times as valuable as foreign sheep's wool, being valued in 1920 at £75,434,000 compared with £12,288,000 from foreign sources or a total of £87,622,000, representing imports of 872,800,000 lbs. of raw sheep's wool. The wool trade, therefore, may be considered as an imperial industry, for the supplies of British wool come from the following British countries in the order named: Australia, New Zealand, South Africa, the Falkland Islands, India, and Kenya; while a great woollen manufacturing industry forms one of the staple trades of the United Kingdom. It is, therefore, of special interest to trace the beginnings of this industry in the British overseas Dominions.

The industrial growth of Great Britain made possible the expansion of the distant provinces of the empire, and certainly the main factor in this growth, so far as the Australasian colonies are concerned, was wool. There is considerable controversy regarding the beginnings of the industry,¹ but a few facts emerge from the mass of contradiction and conjecture which show clearly that individual enterprise in Australia and Governmental aid in South Africa laid the foundations of the industry. In Cape Colony at the time of the first British occupation, there were a few Spanish merino sheep, but the indigenous South African breed—the parti-coloured, lop-eared, and fat-tailed variety which is now seldom seen—

¹ For a more detailed statement of the origin of the wool industry in the Dominions, the reader is referred to an article by the present writer in *United Empire* for October, 1912.

predominated and the increase in the merino sheep was a slow process and, in spite of government support under Sir David Baird in 1806, it was not until the Boer farmers started on their long trek into the interior and British settlers commenced farming in the Albany district that the production of wool, apart from the growth of mutton, became firmly established. Gradually the South African wool was improved and the recovery in the industry after the South African War was in part due to the importation of some thousands of Australian sheep in order to replenish the reduced stocks. The greater part of the sub-continent is suited for the pastoral industry, and in 1920 the value of sheep's wool exported from South Africa was £15,988,000 compared with £8,236,000 in 1921. The greater part of the wool is exported through Port Elizabeth, the principal wool market as well as the chief centre of the ostrich feather trade, and wool forms the most valuable commodity, with the exception of gold, exported from the Union. By far the largest number of sheep are reared in the Cape Province, where the Great Karroo, an immense elevated plateau about half the size of England, and the Little Karroo, as well as British Bechuanaland, afford sustenance for millions of sheep. Next comes the Orange Free State, which is a large grassy plateau supporting nearly ten million sheep, and then the high plateau of the Transvaal. Natal, being more tropical in character, is not so suited for sheep; but it is believed that the late German South-West Africa (now the South-West Africa Protectorate), can become a considerable sheep country, although on the whole it seems more suitable for cattle. In addition to sheep, South Africa (the Cape Province predominating), is a great country for Angora goats, and mohair to the value of nearly one million pounds is exported annually; but the demand for this commodity is fluctuating and uncertain.

In Australia the history of wool is to a remarkable extent the story of Australia itself, at any rate it is closely connected with the early days of the southern continent. When Philip arrived with his band of settlers there was not a single sheep in the country. To-day it is estimated that there are 77,898,000, and the average annual value of sheep products exported during 1918-1921, without

taking into account internal consumption, is estimated at no less than £45,149,000. Australia has had its ups and downs in the wool industry and has never again attained the large number of sheep (nearly 98,000,000), which she supported prior to the drought years of the nineties, but her powers of recuperation and recovery after prolonged drought are remarkable and the great pastoral estates, some of which cover hundreds of square miles, are generally re-stocked within a comparatively short period.

The absence of all the domestic animals on the island-continent made it a paramount necessity that an ample supply of live-stock should be imported if Europeans were to settle in the country. Accordingly the history of colonisation commences with the arrival at Botany Bay in 1788 of Captain Philip with his human and animal cargo, the latter consisting of seven horses, six cattle, twenty-nine sheep, twelve pigs, and a few goats. From these small beginnings have sprung the vast numbers of domestic animals, which are to-day the "flower and strength and blood" of Australia; and as in mediæval England sheep were the staple of our country, so in Australia, the production of wool has become the principal industry. The original stock, of course, has been supplemented by many subsequent introductions, particularly with a view to improving the quality of the wool—and the beginnings of this vast industry were due primarily to two men—John Macarthur and the Rev. Samuel Marsden—whose names deserve to be recorded in letters of gold in every Australian capital. Spanish sheep were introduced from the Cape of Good Hope, and samples of wool were sent to England, where in 1803 it was reported that "the specimen of wool brought from New South Wales is deemed superior in point of softness, and in all other respects equal to the best Spanish wool"—so soon had the fact been established that in quality at least Australian wool, in a free market, would be able to beat all possible competitors. Until Australian wool received a preference in the British market, however, it was not able to overcome the primary disability of the increased cost of carriage due to distance.

The quality of Australian wool is proverbial. The best is universally known as "Botany," a name it

acquired when Botany Bay was synonymous with Australia. For many years the chief endeavour of the pastoralist was to produce the best possible quality of wool, as it still is in a large number of cases; but more recently, owing to the growth of the frozen meat industry, considerable changes have been introduced. Far away from the confines of Melbourne and Sydney are the great wool-producing areas; nearer to the coastal districts are the vast supplies of wool plus meat, and, briefly stated, it appears that the coastal districts are not suited for merino sheep which will thrive on nutriment that would be insufficient for the larger meat-producing variety. There are, however, enormous tracts of country in Australia that are still unoccupied and can only be utilised by an extension of the pastoral industry into districts where there is at present very little population. In the Northern Territory, for example, there are great stretches of country capable of supporting large flocks. The opening of Australia by means of the pastoral industry has an important bearing upon imperial economics because, generally speaking, sheep-rearing has preceded closer agricultural settlement and paved the way for the coming of a greater population.

Apart from the superior quality of the Australian fleece there are other factors that determine the choice of the European buyer. The first and most important is the uncompromising honesty of the grading. A buyer knows exactly what he is getting and the genius of the Australian wool-classer, who can as easily tell the endless varieties of wool as the ordinary man can distinguish chalk from cheese, accounts for the fineness of the grading. Australian wool, unlike certain other wools, is exactly what it is branded and is always the same from year to year. For this reason it was greatly sought after by Continental buyers in the years previous to the war, so that although the output of wool showed a constant increase the amount imported into Great Britain showed an equally constant rational diminution. Thus of the wool exported in 1896 the mother country took nearly three-quarters, whereas in 1912 less than two-fifths reached the home markets. One result of the war, however, has been to disturb the great wool markets of Europe, so that the position is now reversed and during the past five years

three-quarters of the clip has been exported to Great Britain; the United States coming second, and then Italy. The fact, however, that the world's markets are open to Australian wool is of great significance to the future of the industry and the increasing consumption by Japan, which in 1906 took only 435,000 lbs. of the Australian product, but now imports nearly 5,000,000 lbs. annually, is a factor of high importance in connection with the development of trans-Pacific trade.

The early history of New Zealand was too stormy and eventful to permit of the establishment of flocks and herds. It is true that both Captain Cook (in 1773), and the Rev. Samuel Marsden (in 1814), attempted to introduce sheep, but it was not till long after the industry had obtained a successful footing in Australia that sheep-breeding became a considerable occupation. In 1858, there were 1,523,000 sheep in the country, and by 1920 these had increased to 23,914,000, the most remarkable feature in the growth of the sheep-population being that, unlike Australia, it has been practically continuous, and has only diminished slightly in two separate years from what it was the year before. In New Zealand, however, the breeding of sheep for meat has become a very considerable factor during recent years. The production of wool, therefore, although still the largest item of the sheep industry, is closely approached by the exports of frozen mutton, the respective figures in 1918 and 1919 being as follows: frozen meat £4,975,000 and £9,628,000, and wool, £7,577,000 and £19,599,000 respectively. Of the wool produced in New Zealand by far the greater amount of the exports, practically the whole in certain years, has gone to the United Kingdom. The great New Zealand sheep districts in their order of importance are Hawkes Bay, Wellington, Canterbury, and Otago, and the total number of sheep in New Zealand exceeds the total of the Australian State of Victoria, but does not reach that of New South Wales, the great pastoral country of the Commonwealth.

Four other wool-producing regions of the British Empire remain to be noticed—Canada, the Falkland Islands, India, and Kenya. In the first, sheep-raising has never assumed the importance which it has usually attained in the great agricultural and pastoral countries of

the world and the sheep of the Dominion do not exceed a total of 3,421,000, the greater part of which are in Ontario and Quebec. Canada, therefore, has come to be an importer of raw wool (to the extent of 17,672,000 lbs. in 1919), some proportion of which comes from Australia. The reasons for the decline of sheep farming in Canada are not difficult to appreciate. Although both soil and climate are adapted to the keeping of sheep, the severity of the winter, when sheep have to be well housed instead of being allowed to roam over the plains, places a severe handicap on the farmer. Thus the vast flocks of the Southern Hemisphere are unknown in British North America and sheep-rearing has become only a subsidiary industry of the farm, while the organisation of the wool-industry leaves much to be desired. The introduction of large quantities of foreign wool during recent years is a matter that might perhaps be remedied by better organisation and improved methods, and the fact that Canada is now an importing instead of an exporting country is mainly the fault of the local methods of production. In respect of organised sheep-farming Canada has something to learn from the Falkland Islands, situated far south in the Atlantic Ocean, although during and since the war the runs have been neglected. These islands have exported annually about four million pounds of wool to the British markets and as the quality is good, there is a steady demand for it. The sheep industry in the Falklands is in the hands of about thirty farmers and companies whose stations vary in size from 700,000 to 1500 acres; the largest at one time carrying nearly 200,000 sheep and the smallest a few hundred. Although described by Darwin as "an undulating land, with a desolate and wretched aspect," the islands are eminently suited for sheep, and this far away dependency, with a population of some 3200 sturdy Britishers, mostly of Scottish descent, supports some 667,000 sheep. The practice is to boil down annually the surplus stock for tallow, the flesh being thrown away—a waste of good mutton that should be remedied in the near future.

Another part of the British Empire far away from the Falklands and possessing a highly different climate is also admirably suited for sheep, which are animals that thrive under most varied conditions of climate and

surroundings. The Kenya Colony, more particularly on the highlands about Naivasha and Gilgit, the Uasin Gishu plateau, and the slopes of Mount Kenya, now supports considerable quantities of sheep, giving a good yield of wool which finds its way to the European markets. On the other side of Africa, in portions of Northern Nigeria, it is believed that the native sheep could be replaced by European breeds. Although little has been done in this respect certain French authorities have reported enthusiastically about the possibilities of establishing a great sheep-rearing industry in their Sudan territory where the conditions are similar to those in Northern Nigeria.¹

In India the rearing of sheep and the production of wool are entirely in the hands of village shepherds. The wool consequently falls for the most part into the lowest of the three classes into which the article is classified for trade purposes (*viz.*, merino, crossbreeds, and carpet-wool), and the exports from India are generally used for making blankets, rugs, carpets, and felt. The quantity of wool exported averages about 62,000,000 lbs. annually, valued at about £3,500,000; but of this amount about one-quarter comes from countries beyond India, such as Tibet, Afghanistan, and even Persia and Bokhara. India also manufactures a good deal of woollen materials, but the greater part of the Indian product is exported.

Before concluding this section something should be said about the extension of the woollen industry in the British overseas Dominions. During recent years there has been a considerable growth of manufacturing in Australia, and it is probable that in the not distant future the Commonwealth may be in a position to make all the woollen materials needed for her own consumption, but at the present time she imports nearly £6,000,000 worth of woollens in a year. The actual local production, however, was valued at £4,241,000 in 1920-21, consisting chiefly of tweed cloths, flannels and blankets, the industry having nearly doubled in capacity and output during the past five years. It is evident that with the extension of these manufacturing activities in a great wool-producing

¹The possibilities of a sheep industry in West Africa may be studied in Capt. W. P. B. Beal's "Report on the Live-stock Industries of the Northern Territories of the Gold Coast," 1920. At present all the sheep produce hair and not wool.

country, the manufacturers of Bradford and elsewhere will have serious competition in the Southern Hemisphere. Similarly, Canada is now a considerable manufacturer of woollen goods and yarns, and makes about as much as she imports, while New Zealand also has flourishing wool-mills employing nearly two thousand hands and supplying much of the local needs.

Spices.—The trade in spices is perhaps the oldest, and during the Middle Ages it was one of the most important, branches of commerce between Europe and the East. There was then a general belief that most of the spices imported into Europe came from Arabia, and although doubtless large quantities of certain spices were exported from Southern Arabia, which in the annals of romance became celebrated as the land *par excellence* of spices and perfumes, just as Ceylon in the juvenile mind is noted for its "spicy breezes" and Africa for its "coral strand," by far the larger amount came from Southern India, and the islands of the East. It was, however, the Arab merchants who brought spices to Europe, either over the long land routes open to commerce prior to the Moslem invasion of Syria and the Fall of Constantinople, or by way of Aden, the Red Sea, and Alexandria, which became a great entrepôt for all sorts of Eastern commodities and was so important as an exchange that in the year 1172 Benjamin of Tudela tells us that "it was full of bustle, and every nation had its own fonteccho there." Long prior to this date spices were a great article of commerce: both the Greeks and Romans traded in them and used them extensively, and the latter probably introduced them into Great Britain or possibly they were brought even earlier by the Phœnicians, the great traders of antiquity, in exchange for tin. In any case, pepper, one of the principal of our spices, was highly prized in the days of Ethelred the Unready (866-871), when merchants who traded at Billingsgate had to pay ten pounds of pepper as a tribute at Easter and Christmas. From that time forward spices became a great commodity of commerce in mediæval and more modern England, when, in view of the comparative smallness of the population, their consumption was enormous. Not only were they used for flavouring the great quantities of salted meat and fish that were

consumed but for many other purposes and the national palate at that period must have been tickled by spices—spiced ale and whatnot—to an extent almost as great as is the Indian and Anglo-Indian palate of to-day.

The importance of the trade in spices is one of the outstanding features of mediæval life. Venice rose to its pre-eminence as a great distributing centre largely owing to its position on the trade routes to Western Europe, and its decline was due, in no small measure, to the diversion of much of this trade owing to the discovery of the sea-route to the East, via the Cape of Good Hope, and the consequent carriage of spices in the vessels of the Portuguese, who very soon obtained a large share of the trade. From the Venetians the trade passed successively to the Portuguese and the Dutch, the Spaniards also attempting to wrest it from them when they opened the route to the Philippines and the Moluccas by way of Cape Horn. Subsequently the East India Company developed a great trade and each in turn sought to secure a monopoly of this highly profitable and essential commerce, the Dutch during their occupation of Ceylon making it a capital offence to grow cinnamon trees on private lands, and taking other stringent measures to retain the control of the spice trade.

At the present time the trade in spices forms a considerable item of British commerce, the consumption of the United Kingdom being valued at £687,363 in 1913, and £4,012,112 in 1919. Unfortunately it is not possible to determine the exact imports of the different spices, with the exception of cinnamon, ginger, pepper, and cloves, as separate returns are not issued by the Board of Trade. Of some of the principal spices of the East, however, very little is consumed in Great Britain, while in any case the United Kingdom serves as a clearing-house for certain spices as is apparent from the following figures for imports and exports respectively in the years 1919 and 1920 :—

	IMPORTS.		EXPORTS.	
	1919.	1920.	1919.	1920.
	£	£	£	£
Cinnamon	193,000	97,000	143,000	91,000
Ginger ..	271,000	109,000	103,000	153,000
Pepper	2,289,000	916,000	1,311,000	700,000
Cloves ..	No figures	604,000	No figures	513,000

It will be seen from the above figures that the actual amount consumed within the United Kingdom is very much less than the import returns indicate and that although spices form an important item of production within the British Empire they are of comparative unimportance so far as Great Britain is concerned, except as articles of trade.

Pepper, which forms by far the most valuable of these commodities, comes mainly from the Straits Settlements and dependencies, but the figures of imports into the United Kingdom from this source are entirely misleading because much of the pepper exported from Singapore comes in reality from French Indo-China, Sumatra, Borneo, and other Dutch East Indian islands. Considerable quantities also come from India, Ceylon, Kenya, and Sarawak. The pepper is of three kinds—white, derived from the riper berries, black, obtained from the unripe berry picked green, and red or Cayenne, which is got from an entirely different plant to ordinary pepper, viz., from different species of capsicum, which under the name of chillies are extensively grown in Kenya, and other tropical countries, having originally come from South America and particularly the Guianas, whence the red pepper derived its name of Cayenne. India has a large export of pepper and it is extensively cultivated by Europeans and Indians in and between the Western Ghats from Karwar to Cape Comorin, particularly in Malabar, Cochin, and Travancore. The internal consumption is large. Of the enormous quantities of chillies grown in India, where in Madras alone it is estimated that some 300,000 acres are planted annually, the greater part is consumed locally in curries, chutneys, and other food preparations, but there is also a large export to other Eastern countries and to a smaller extent to Great Britain. Of other Indian spices and condiments, cardamoms and betel-nuts are of local importance but not much used in Europe. The former for purposes of export go mainly to Germany and Scandinavia, where they are used in, and sometimes to disguise the flavour of, the ubiquitous sausage. The latter takes the place for Indians of the chewing-gum of the American, and the internal demand for this common masticatory of the East is so great that imports are also taken from Ceylon, Straits Settlements,

Java, and China. The exports of arecanuts, which is only another name for the betelnut, form a considerable item of Ceyloneſe trade, averaging in weight about 130,000 cwts. per annum. Cummin, now a little known spice, is exported from India in small quantities and was originally derived from the Upper Nile regions.

Cinnamon, another important commodity, is extensively cultivated in Ceylon where, however, the areas in which it can be grown are limited, as the tree is exacting as to soil and climate. It is also grown in the Seychelles, which islands are admirably suited for its cultivation, and to which it has been introduced from Ceylon, its original home. This is the true cinnamon of commerce, but there is another product known as cinnamon, derived from the *Laurus cassia*, the greatest portion of which comes from China, although the tree is common in many parts of the tropics and sub-tropics. Nutmegs and mace also enter largely into commerce, the latter being the dried covering of the nuts. Our supplies are mainly derived from foreign sources (the Dutch East Indies), but the tree which produces nutmegs (*Myristica fragrans*), is now grown in Grenada and other West Indian islands. Allspice or pimento, also known as Jamaica pepper, is a product of the West Indies, chiefly Jamaica, from which there are considerable exports and where a pimento-oil industry is being established. Vanilla, originally derived from Mexico, has been introduced into islands in the Indian Ocean, especially Mauritius and Seychelles, but its export is negligible in comparison with the French islands of Réunion and Madagascar, and our main supplies are derived from foreign sources. Dried ginger comes almost exclusively from within the British Empire, from India, West Africa (chiefly Sierra Leone), and the British West Indies, but ginger preserved in syrup mainly comes from China, through Hong Kong. It has been cultivated in India for centuries, chiefly on the Malabar coast, and the internal consumption is very great. Cloves, which are also cultivated extensively in India (particularly in the Madras Presidency), and form an important item of internal consumption, are also imported into India from Zanzibar and Pemba, which between them contribute fully four-fifths of the world's supplies. In both these islands the cultivation of cloves forms the staple industry,

and the scent of the plantations can be detected, as one approaches Zanzibar by sea, for a distance of some miles. Most of the cloves imported into the United Kingdom come from Zanzibar (£521,000 out of £604,000 in 1920), and probably some of the cloves returned as exported from India come originally from the same source. The annual value of the cloves grown in Zanzibar is about £700,000.

Tobacco.—Although the British Empire possesses millions of acres suitable for the cultivation of tobacco and consumes enormous quantities, the extraordinary position is shown, by reference to such figures as are available, that we produce within the empire only a very small, though happily increasing, proportion of the tobacco that is consumed. Probably with respect to no industry are the returns, both British and foreign, so unreliable, and it is practically impossible in view of the present state of statistical information to arrive at any satisfactory conclusion as to the total amount of tobacco grown and consumed within the world. In the case of India, which is a great tobacco-producing country, having over one million acres under the crop, rough estimates have been made of the total production. In the same way in Canada it is possible to arrive at an estimate of the local growth of tobacco, but far less easy in view of the imports and exports of the raw material to arrive at any definite conclusion as to the amount consumed per head of the population. For purposes of comparison, however, it may be assumed that, taking the principal countries only of the British Empire, the annual consumption of tobacco is somewhat as follows :—

United Kingdom	..	..	200,000,000 lbs.
Canada	..	..	30,000,000 „
Australia	..	..	22,000,000 „
South Africa	..	..	8,500,000 „
New Zealand	..	..	5,000,000 „
India	..	..	500,000,000 „

These immense quantities, with the exception of India, Canada (which produces almost as much as she consumes), South Africa, and to a very small extent Australia, are imported from foreign countries, a position

which, in view of the constantly increasing consumption of tobacco and the enormous sums that are spent upon it, is distinctly injurious to the empire and should be remedied at the earliest possible moment. Tobacco, however, is one of those crops which it is most difficult to produce in the quality and grade required by the consumer, in which the requirements of the home markets are the most conservative, in which organisation on the part of planters both for the actual production and marketing of the product is essential, and in which a high degree of technical skill and the utmost care are required in order to produce a tobacco free from the defects that are so generally apparent in tobacco that has been grown and handled by planters not possessing the necessary technical skill. It is partly for this reason that tobacco-growing has not been entirely successful in Australia, where the industry has made no progress and has, indeed, decreased during recent years.

Since the opening of the war there has been a continuous increase in the importations of tobacco into the United Kingdom. Unmanufactured tobacco rose from 162,365,000 lbs. in 1913 to 219,012,000 lbs. in 1920 (having reached the enormous total of 348,006,000 lbs., valued at £38,217,000 in the previous year), while the imports of manufactured cigarettes, the consumption of which has largely increased owing to the growth in the number of women smokers, rose from 314,000 lbs. to 1,535,000 lbs. in 1920 (4,460,000 lbs., valued at £1,017,000 in 1919). Of this amount the British Empire's share of the United Kingdom market has increased from 1.4 per cent. to 8.5 per cent.—a highly satisfactory result to have been achieved within a comparatively short time, but small when considered with regard to the leeway that must be made up before the tobacco-market of the United Kingdom can be considered to be under the control of colonial interests, instead of being in the hands of American producers as it now is. To the raw tobacco imported into the United Kingdom eight British countries, in the order named, contributed in the year 1920—India, Nyasaland, British North Borneo, South Africa, Canada, Rhodesia, Cyprus, and Hong Kong; while cigars came from India and the West Indies. These returns show that tobacco, although native to warm countries, has a

very wide habitat, and that the British Empire, with its farflung possessions, should be able in time to produce all the tobacco that is needed in the United Kingdom and the Dominions.

In considering the possibilities of tobacco cultivation within the empire it is evident that there are certain classes of tobacco that are not likely to be supplanted in the British market. Sumatra, for instance, which supplies the finest leaves for cigar wrappers, is likely to retain its monopoly of this important commodity for many years to come; although it is possible that with the necessary scientific knowledge and technical care this product may be rivalled in time by countries within the empire. The well-known Havana cigars and tobaccos of a peculiar and specific flavour are also likely to hold their own, but there is no reason why the usual kind of Virginian tobacco cannot be successfully cultivated in many parts of the empire. In any case a considerable extension of tobacco growing is to be looked for in British North Borneo which owing to a progressive policy has lately come prominently into the market, in Nyasaland, which of all parts of the empire has made the greatest progress in this industry during recent years, in Rhodesia and South Africa generally, and in both West and East Africa where, however, up to the present there has been little or no organised effort to provide for the tobacco needs of the United Kingdom.

Considering the tobacco-producing countries of the empire in their order of importance, it is evident that India with its enormous cultivated acreage and great local consumption (though small in comparison with its immense population) easily heads the list. As the imports of tobacco into India greatly exceed the exports, it is clear that there is considerable headway to be made before India will have an exportable surplus of tobacco. The imports of cheap cigarettes, however, show a decrease owing to the establishment of a number of factories in India, and there is no reason why there should not be a far greater development of tobacco cultivation to replace imports and possibly, as the local varieties of tobacco are improved, for export also. The agricultural departments are making every effort to introduce a finer tobacco, and Sumatra tobacco is being grown with success in

certain districts. Indian cigars are exported in considerable quantity (1,733,000 lbs. in 1913-14), but mainly to British Malaya, while manufactured tobacco (2,206,000 lbs. in 1913-14); and unmanufactured tobacco (27,817,000 lbs. in 1913-14 and 31,506,000 lbs. in 1918-19), are also exported; but so far as the United Kingdom is concerned much of this tobacco has been used for tanning purposes and not for smoking.

By far the most promising region in the British Empire for the production of tobacco is Nyasaland, where the industry has made substantial progress during recent years. In 1920, for example, some 5,505,000 lbs. of unmanufactured tobacco was imported from Nyasaland, and with the extension of railway communication there is sure to be a considerable increase of the plantation industry. Virginia is the staple product. In Southern Rhodesia both the Turkish leaf tobacco and Virginia have been cultivated, but production has varied largely and the amount imported into the United Kingdom is not large, the tobacco surplus being consumed locally or imported into other parts of South Africa. It is established, however, that Rhodesia can grow tobacco of good quality, and there is no reason to doubt that the industry will be greatly extended. In 1920, for the first time the substantial total of over 2,000,000 lbs. was handled in the Salisbury tobacco warehouse, while the total produced in the country was nearly 3,000,000 lbs. Rhodesia tobacco possesses certain natural qualities that commend it to the manufacturers of South Africa, but the quality of the cured product has yet to be greatly improved before it can take a high place in the market. In the Union of South Africa the greater part of the production is consumed locally, although there is an increasing demand for the better varieties of the South African tobacco in Great Britain. The Transvaal is the largest grower, the best qualities coming from the Magaliesberg and Piet Retief districts, but tobacco is also grown in the Cape Province, especially around Oudtshoorn, Swellendam, George, and the Paarl; in Natal; and the Orange Free State. The total annual output is about 8,000,000 lbs., of which only a small proportion is of Turkish leaf. In Kenya most of the tobacco is grown by the natives for their own use and is of a coarse quality, unsuited for the

European markets, and no attempt has been made to establish an industry on a large scale.

In Canada the position as regards tobacco is somewhat obscure. Although Canadian growers are making an effort to supply the requirements of the British market, they have not yet succeeded in producing a tobacco which meets the home demand. On the other hand they are able to supply very large quantities for the local market and there is a general tendency for the expansion of the industry in Ontario and Quebec, where it is almost exclusively grown. The total value of the tobacco crop in 1919 was about £2,400,000, representing 27,379,000 lbs. of tobacco. As there is an excise and customs duty on the tobacco it should be comparatively easy to get an estimate of the local consumption which in 1919 was stated to be 24,600,000 lbs., exclusive of cigars, but in addition another 25,103,000 lbs. was imported, and it is not clear from the Canadian figures what became of the surplus, very little of which was exported. In Australia in conformity with its policy of stimulating Australian industries the Commonwealth Government has given considerable attention to locally grown tobacco. The Commonwealth consumed in 1920-21 about £3,362,000 worth of tobacco from the United States, and it is evident that, if Australian growers could only learn how to cure their tobacco so as to compete successfully with the imported varieties, there is a large available market in the country. It is this particular phase of the question that is attracting the attention of the government, because with the rapid decline in tobacco growing that has taken place in the Commonwealth the general collapse of the industry may be looked for unless improvement is effected. Certain figures prepared in 1920, showed a local production of 2,827,000 lbs. from 3087 acres, but in 1920-21 only 1345 acres were under tobacco.

To sum up, it is evident that in most parts of the British Empire there is the greatest need for a scientific organisation of the tobacco industry, so that full advantage may be taken of the preference in the British markets. Inferior tobaccos are not likely to displace the long established varieties imported from America simply because they have a preferential treatment, and in any case there are highly organised interests concerned with

the distribution, manufacture, and sale of tobacco in Great Britain which, wherever hostile, have to be fought in order that British produce may replace the foreign tobaccos that are now almost exclusively used. For this purpose local organisation is necessary in the exporting countries, accompanied by representation of their interests in London by agents capable of pushing the sale of colonial tobaccos.

Drugs and Medicines: Dyes.—In a book of this nature it is not possible to deal other than superficially with many important products of the British Empire. In the case of drugs and medicines this is specially the case as the number employed is so large that nothing short of a treatise on the various plants and other products used in therapeutics would do adequate justice to this interesting topic. A few broad facts, however, should be mentioned and brief particulars concerning the principal medicinal products included. In the Board of Trade returns the imported drugs, medicines, and medicinal preparations are divided into twenty-three classes, including cocaine, morphia, quinine, asperin, menthol, sugar of milk, medicinal oils, ipecacuanha, nux vomica, opium, senna, and proprietary medicines, and the total value of these and others included in this classification imported in the year 1920, was £5,051,000 of which £990,000 worth came from within the British Empire. By far the most important of these imported medicines is quinine, which accounts for almost one-fifth of the total.

Quinine is the product of the chinchona tree and is, of course, one of the most valuable and precious medicines known in the art of healing, of special value in the tropics where it is used as a preventive against malaria. Our greatest source of supply is Java, which sends about nine-tenths of our imports, although the tree originally came from Peru, where quinine was long used by the Indians before it was exported elsewhere. The story of the bringing of the plants to India and the subsequent planting of the seeds in the East is one of the romances of medicine comparable in interest with Sir Henry Wickham's gathering of the rubber seeds of Brazil. Three separate expeditions were sent to Peru, the most important being that under Sir Clements Markham. The

planting of chinchona in India has been of the utmost service to the natives. The plantations were started in 1862, and are chiefly situated in the Nilgiri Hills, Coorg, the Malabar district, and around Darjeeling. Of recent years the exports of bark have been inconsiderable and unless the area under cultivation is extended the British Empire will remain dependent upon Java for its supplies.

Opium, the second most important drug imported into Great Britain, comes chiefly from Turkey, although considerable quantities are sent from India, where the white poppy is extensively cultivated in the valley of the Ganges, and in certain native States of Central India, such as Indore, Gwalior, and Bhopal. Opium from these States is known as Malwa opium, and is not subject to supervision by the Indian Government. In British India, however, cultivation is only permitted under licence, and by arrangement with the Chinese Government the area under cultivation has been greatly reduced and exports to China have been discontinued. The value of the opium exported from India is about £2,000,000 annually, and the Indian Government derives a revenue of over £3,000,000 from the licences for its cultivation.

Another important medicine that comes entirely from foreign sources is menthol, which is sent chiefly from Japan. The value of the imports of this article in 1920 was £380,000. Camphor, which is not included in the Board of Trade classification mentioned above, is the product of the camphor laurel and comes chiefly from Formosa and Japan, with considerable quantities from China and the United States. A large amount is exported to this country through Hong Kong, and a smaller quantity comes from India. The tree has been introduced into South Africa and the West Indies, and there is no reason why a considerable proportion of the imports (valued at £960,000 in 1920), should not come eventually from British territory. Eucalyptus oil, a typical Australian export, is the product of the leaves of the Australian blue gum tree, one of the largest known trees, which grows all over the Commonwealth, but has been acclimatised in Southern Europe, South Africa, and other warm regions. It chiefly comes from Victoria and in

1920-21 eucalyptus oil to the value of £107,000 was exported, mainly to Great Britain. Both the consumption and the output are increasing. Of other medicines, ipecacuanha comes chiefly from Brazil and Uruguay, but small quantities are exported from British Malaya; and senna comes largely from India, and the Anglo-Egyptian Sudan. The latter is derived from the leaves of *Cassia angustifolia*, the chief source of supply being the Tinnevely district of the Madras Presidency. Nux vomica, which is commercially important as the source of the alkaloids strychnine and brucine, is also an Indian product.

Of the vegetable dye-products used in commerce the most important are cutch, logwood, indigo, fustic, and madder. These, with others, were the chief source of our dyes previous to the discovery of the coal-tar or aniline dyes, which although first discovered in Great Britain form the basis of the great dying industry built up in Germany previous to the war. Of the vegetable dyes, cutch, fustic, and logwood are the only ones that maintain their position in the dyeing industry; indigo, which at one time (1894-95), was cultivated most extensively in India, having gradually been displaced, although there has been some revival during recent years. Indigo is the product of several species of plants, and for centuries the position of India as the centre of this industry remained unassailed. In 1920, indigo to the value of £97,000 was imported into Great Britain. Cutch, or catechu, is another imported Indian product, obtained from the *Acacia catechu*, and yielding a good brown dye. The imports have increased largely since the beginning of the war, over £231,000 worth having been imported in 1920. Fustic, a yellow dye-wood, comes chiefly from France and the United States, and logwood is the heart-wood of a tree growing throughout Central America and the West Indies. It is imported into this country both as a wood and as an extract, about half the imports coming from within the empire, mainly the West Indies and British Honduras. Lac dyes have almost ceased to be produced, although they give a fast red tint to silk and wool; but cochineal still holds its own, and comes almost entirely from the Canary Islands. Both are the products of an insect.

With respect to the aniline dyeing industry it need only be remarked here that the discovery in 1856 by Mr. W. H. Perkin laid the foundations of one of the most important industries, with far-reaching results both to this country and Germany. Previous to the war, coal-tar dyes to the value of nearly £2,000,000 were imported into this country, chiefly from Germany, where about seven hundred synthetic dyes were obtained from coal-tar products. Great efforts, assisted by financial support from the Government, have been made to capture this industry; but considerable quantities of coal-tar dyes continue to be imported, amounting in value to £8,356,000 in 1920, by far the greater part coming from Germany and Switzerland. The success of the British industry depends upon the ability of our scientists to produce the dyes prized in commerce, upon the support that is accorded to their efforts, upon the recognition that scientific knowledge is worth a high price and should be paid adequately, and upon the ability of dyes produced in England to compete with the cheaper, and sometimes better, products of Germany and Switzerland. So much depends upon this industry that it is merely a truism to state that every effort should be made to continue and extend the work that has already been done and to place the industry upon a stable and secure basis.

Closely allied to the dyes are the substances used for tanning. Of these the most important are various kinds of barks and other vegetable products. The principal are quebracho, which comes almost exclusively from the Argentine, to the value of over £1,000,000 in 1920; wattle, myrobalans, sumach, valonia, and gambier. Myrobalans form the chief tanning material used in India, and large quantities are exported; nearly £600,000 worth being imported into Great Britain in 1920. Sumach comes almost entirely from Italy and valonia from Asiatic Turkey, while gambier, closely allied to cutch, comes from British Malaya and other British territories in the East. The wattle bark industry has been developed chiefly in Natal, where extensive plantations have been formed. The main market for the bark used to be Germany, but successful efforts have been made to secure a greater sale in Great Britain, both for the bark and for the extract. Factories for the production of the extract have been

started in South Africa, from which in 1920, extract to the value of £323,000 was exported. In the same year bark to the value of £572,000 was exported from the Union of South Africa, of which almost the whole came from Natal, and was sent to Great Britain. Wattle plantations have also been started in Kenya and Tanganyika, and in Australia the wattle is grown extensively and the bark is also exported.

CHAPTER XII

COCOA, TEA, COFFEE, AND RUBBER

A FEW years ago it was correct to state that very nearly the whole of the cocoa production of the world came from countries outside the British Empire, chiefly from Ecuador, Brazil, and Venezuela, and more lately from the Portuguese and Spanish islands off the western coasts of Africa. To-day considerably more than half of the world's supply comes from British territory. Few crops have had a more remarkable history so far as areas of production are concerned, for a century ago Venezuela was first among the cocoa-exporting countries, to be surpassed fifty years later by Ecuador, which in turn has been displaced during the last ten years by the Gold Coast Colony, which now grows as much cocoa as all the South American countries put together and more than twice as much as the rest of the British Empire. This is the more remarkable as the cocoa plant (*Cacao theobroma*), is indigenous to Central and South America, and was first heard of in Mexico, where it is recorded that Montezuma was so fond of chocolate as a beverage, that "no less than fifty jars or pitchers were prepared for his own daily consumption, and two thousand more were allowed for the consumption of his household." There is no record of the size of the jars which, in Montezuma's case, we trust, were small.

The taste for cocoa and chocolate was transferred to the Old World, and within recent years there has been a remarkable increase in consumption not only in this country, but among those nations where as a beverage it is much more used than in Great Britain. The increase has been particularly large during and since the war, as is demonstrated in the following figures showing the world's production in the years 1913, 1919, and 1921, the last figures being approximate :—

COUNTRIES.	EXPORTS IN METRIC TONS.		
	1913.	1919.	1921.
Gold Coast	50,000	176,000	132,000
Nigeria.. ..	3,600	25,000	20,000
Ceylon	3,500	2,700	3,100
Trinidad	21,000	27,000	34,000
Other British West Indian Islands ..	8,800	9,500	9,000
Other British countries	1,400	3,800	3,500
Total British Empire	89,000	245,000	201,000
Ecuador	42,000	40,000	44,000
Brazil	29,000	62,000	41,000
S. Thomé and Príncipe	35,000	49,000	28,000
San Domingo, Haiti, and Cuba	23,000	26,000	30,000
Other countries ..	41,000	41,000	43,000
Total	259,000	463,000	387,000

Of this amount the United Kingdom took 110,000 tons in 1919, exporting again 28,000 tons, the other great consumers being the United States (which is now seeking to establish a great cocoa industry in her West Indian satellites and imports on an average about 150,000 tons annually), France, Holland, and Germany.

The production of cocoa in West Africa is one of the most remarkable examples of the introduction of a new industry to the natives, of their ready adaptability to fresh conditions, and of the establishment of a purely native industry where native initiative and labour have been responsible for its success, and for the fact that the West African cocoa has been able within a short period to command the largest share of the world's market. Its introduction was due to a native whose name, Tettey Quashie, deserves to be recorded as a pioneer of industry. Returning from the Spanish plantations in Fernando Po he brought with him a few plants and pods of cocoa, introduced them to his countrymen, started planting, and was responsible for the first export of cocoa (valued at £6), from the Gold Coast in the year 1885. Since that date cocoa to the value of £8,278,000 has been exported

in one year (1919, an exceptional year). It is interesting here to quote from Sir Hugh Clifford's estimate of the industry. "Every pound," he states, "was grown by native cocoa farmers, aided only by such advice and assistance as could be afforded by an Agricultural Department. . . . With no expenditure of European capital, with only some technical help from the Government . . . the native of the Gold Coast has built up a purely native industry in his own land, as his own landlord, farmer, and vendor. This man, reputed to be lazy by the superficial globe-trotter or the exponent of the 'damned nigger' school, has carved from the virgin forest an enormous clearing, which he has covered with flourishing cocoa farms. . . . Here is a result to make us pause in our estimate of the negro race. A people that can do this under these circumstances will not be a negligible factor in the economic development of the world, when science and the white man's arts and crafts have given them the technical knowledge which they still lack, together with adequate means of transport." We refer specially to these words of an able African administrator, because the cocoa industry in West Africa and the cotton industry in Uganda are standing proofs of the very considerable ability of the African native when economic conditions are favourable for the exercise of initiative and industry.

The cultivation of cocoa has spread from the Gold Coast to other West African countries. In Nigeria there is a considerable industry both in the Western and Central provinces, particularly around Ibadan, Benin, and the Cross River district, and there is great room for expansion, as well as for the improvement of the cocoa. This remark also applies to the Gold Coast cocoa, but unfortunately the incentive of a better price for better varieties does not always appear to be forthcoming, and the cocoa grown in the West Indies, where there are experienced planters, cognisant of the conditions of cultivation, manufacture, and markets, still holds the field for its superior flavour, although Ceylon cocoa is also of high grade. In addition to the Gold Coast and Nigeria, cocoa is grown in the Cameroons, and has been introduced into Sierra Leone, though here the conditions are not so favourable. Among the British West Indies,

Trinidad, Grenada, Jamaica, and Dominica produce considerable quantities, while smaller amounts are grown in Montserrat, St. Lucia, and St. Vincent.

Tea.—In order to encourage the practice of tea-drinking the Indian Government levies a small duty upon each pound exported, for the purpose of propaganda, and the amount received from this special duty is expended in advertising Indian teas in Europe, America, and in India itself. In the last country tea-drinking is gradually spreading among the population, but in the United States the consumption of tea is as yet comparatively small, the Americans greatly preferring coffee and cocoa, and the so-called cooling drinks which form so large an item in the national consumption. It is computed that in the United Kingdom we drink six times as much tea as coffee, whereas in the United States about fourteen times as much coffee and nearly four times as much cocoa are drunk. Similarly, on the continent of Europe, with the exception of Russia, the consumption of tea is negligible : nor is this surprising in view of the lack of knowledge as to how it should be brewed. Tea under Continental management becomes almost as alarming a concoction as was that made by two old people, in the early days of tea-drinking in Great Britain, who boiled the leaves and spread them upon their bread, but threw away the water in which the tea had been boiled. It is evident that the world's consumption of tea, especially since Russia as a great consumer has been practically eliminated, is not nearly so large as it should be in view of its excellence as a beverage, and its highly refreshing qualities. In those countries where the drinking of tea has taken a firm hold its consumption is increasing, but among other nations where tea is practically unknown there is abundant room for propaganda as to its qualities and excellence, and the action of the Indian Government might be followed with considerable advantage by other tea-producers, while the principle of a small tax for the purpose of advertising might be adopted with respect to other commodities for which new markets have to be found or old markets extended. The amount of duty collected is not sufficient to affect the price of the tea, but was large enough (about £28,000) in 1917-18 to enable Indian teas to be extensively advertised by

the non-official committee, which has charge of the distribution of the funds.

The history of the production of tea is of particular interest, because it is the story of the gradual transference of the trade from the first known tea-grower, China, to new (and British) competitors, with the result that of the total world production of tea, or at any rate export of tea, some three-quarters is sent from India and Ceylon, which are comparatively late comers into the tea business. In the latter half of the eighteenth century the most profitable trade of the East India Company with the United Kingdom was in tea from China, of which it had the monopoly. In 1787, over 20,000,000 pounds was shipped and the largeness of this trade led to suggestions that tea should be grown in India where, it was believed that the climate and conditions were equally suitable, a special feature being the abundance and cheapness of labour, which is an essential factor in the production of tea. But little was done until 1834, when experimental cultivation was undertaken, and it was not until 1852 that India was able to compete with the Chinese product in the London market, and not until 1888 that the aggregate export of tea into the United Kingdom from India and Ceylon for the first time exceeded in amount the imports of that of Chinese origin. Since that date the imports of Chinese tea have been continuously decreasing while the Indian and Ceylon varieties have been increasing in favour so that, at the present time, China tea represents less than 4 per cent. of the total tea imported into the United Kingdom.

The principal grades of commercial tea are known as Flowery or Broken Orange Pekoe, Orange Pekoe, Broken Pekoe, Pekoe Souchong, Fannings, and Dust. When only the bud and the two young leaves are taken, Flowery Orange Pekoe is the bud, Orange Pekoe is the tenderer leaf, and Pekoe is the second leaf. During the war, however, when in 1917-18 some 359,000,000 lbs. were exported from India alone, valued at £11,782,000, the Government assumed control of the trade, and graded the tea into three varieties. Under this system the exporters of fine teas suffered and the planters of course varieties benefited, with the result that coarse planting was adopted to the detriment of the plant and industry as a whole. The

subsequent over-production of the coarse varieties, and the large stocks that remained on hand in India, Ceylon, and Great Britain, led to a slump in prices, so that the tea trade was carried on under great difficulties. At the end of 1920, there was a stock of 214,000,000 lbs. of tea in Great Britain, the normal amount being about 90,000,000 lbs., which represents about three months' supply. The result of this over-production has been that a demand has arisen for the finer varieties of tea, that restriction of crops has become necessary, and that efforts have been made by planters to improve in every possible way the quality of their output. The final result cannot but be beneficial to the industry as a whole.

The effect of the preference recently granted upon British teas is that Indian and Ceylon teas are able to hold their own in the British markets, in spite of the fact that tea from Java can be sold at a much cheaper rate. The heavy duty of tenpence per pound on British grown tea, and one shilling per pound on foreign teas (since reduced to eightpence and sixpence and two-thirds) is, of course, a considerable impost on the industry and a serious factor to be reckoned with, but it is small when compared with the duties levied in certain foreign countries, which have the effect of rendering tea a luxury of the rich. Australia, a great tea-consuming country, admits tea free, while the United States, which consumes little tea, also levies no tax. The total imports of tea into the United Kingdom during 1920-21 and 1919-20 were as follows :—

	1919-20.	1920-21.
India	259,829,000 lbs.	292,837,000 lbs.
Ceylon	130,955,000 "	113,880,000 "
China	6,570,000 "	29,404,000 "
Java	46,651,000 "	46,534,000 "
Other countries	973,000 "	6,133,000 "
	<hr/> 444,980,000 "	<hr/> 488,789,000 "

In India the greatest producing area is Assam, where the industry was first established by the Assam Company in 1839. This province accounts for more than 66 per cent. of the tea grown in India. Owing to the at first considerable difficulties of transport, due to absence of

good roads and railways, the carriage of the tea was a long and tedious process, but the Assam-Bengal Railway now brings part of the product direct to Chittagong, while part is borne on the broad waters of the Brahmaputra into Calcutta by an excellent system of cargo steamers. Next to Assam, Bengal is the greatest producer, Darjeeling being a very important centre. Travancore is an important tea-producing State, but elsewhere, with the exception of parts of Madras, the production is not extensive. In Ceylon the growing of tea has made very rapid progress and this country now forms India's most serious rival. Its output is continuously increasing and in 1915 it exported 215,000,000 lbs. compared with an Indian production of 380,000,000 lbs. in 1918. The introduction of tea on an extensive scale into Ceylon was due to the collapse of the coffee industry and the necessity for finding some more remunerative agricultural industry. Other tea-producers in the British Empire are Mauritius, Nyasaland, and Natal. In the last country the industry is decreasing, and the local supplies are not exported beyond the Union of South Africa. The decline of the industry in South Africa is due almost entirely to economic difficulties brought about by the contraction of the supplies of Indian labour.

Coffee.—In the year 1920 coffee to the value of £4,476,000 as compared with £2,920,000 in 1913 was imported into the United Kingdom, and of this amount about one-third was grown within the British Empire. Although it preceded tea as an article of consumption, and the old coffee-houses of London had established a great reputation in the seventeenth and eighteenth centuries as the favourite resorts of the wits and literati of the period, fashions gradually changed and the drinking of tea soon outstripped coffee. On the continent of Europe, however, coffee has long maintained its pre-eminence, especially in Holland and other Teutonic countries, and enormous areas in various parts of the world are planted with the coffee plant (*Coffea arabica* or *Coffea robusta*), in order to supply the European, Asiatic, and American demand. Certain British countries, especially India, contribute to this supply, but the principal sources of the coffee consumed in Europe are certain Central and South American countries, especially Brazil,

Costa Rica, Nicaragua, and Colombia, and, in the East, the Netherlands Indies. Like tea, the coffee plant can only be grown in tropical countries, but its habitat, although it has a much wider range in actual cultivation, is even more restricted than tea owing to the sensitiveness of the plant to changes of climate.

The history of the cultivation of coffee within the empire is a somewhat interesting one. Coffee, it is believed, originated on the southern slopes of the Abyssinian highlands (at no very great distance from regions where it is now being cultivated so successfully in East Africa), whence it was taken by the Arabs at a comparatively late period (presumably as late as the eleventh century), across the Red Sea into Arabia, with which Abyssinia then had very considerable commercial relations, where it became established as one of the principal crops of the Arab States in the south of the peninsula, and was exported from the port of Mocha, from which the Arabian or Mocha coffee derives its name. At the present day great quantities of coffee are grown in southern Arabia, which supplies much of the Eastern market. The dependencies of Aden are contributors to the exports of coffee to Great Britain. From Arabia coffee was taken to India in the sixteenth century, but it was not until 1830 that any serious attempts were made to found an industry. From that time onward large plantations were established in Mysore, Coorg, the Nilgiri and Shevaroy Hills, and the Wynaad. Coffee-planting was also introduced into Ceylon where it soon became so flourishing an industry that in 1869 over 1,000,000 hundredweights, valued at £2,593,000, were exported. Owing, however, to the prevalence of the coffee-leaf disease the yield was gradually reduced, until at the present time coffee-growing has ceased to be a profitable industry. In India, however, although coffee-growing has made no headway during recent years, it has lost little ground, despite the lower prices due to the competition of the South American countries, and Mysore coffee still commands the market for its general excellence.

The area under coffee in India is estimated to be about 210,000 acres, of which half is in the large native State of Mysore, and the greater part of the remainder in the native States of Coorg, Cochin, and Travancore,

and the neighbouring districts of the Madras Presidency. The average output of coffee is estimated at about 750,000 cwts., and of this amount about 259,000 cwts. were exported in 1913-14, and 218,000 cwts. in 1918-19, about one-third of the exports, as a rule, being sent to Great Britain. The coffee estates employ about 35,000 persons permanently, and another 46,000 during the picking season, while considerable numbers are employed at Mangalore, Calicut, Coimbatore, and Tellicherry, where the coffee is prepared for export.

In addition to India coffee is grown in Kenya and Uganda, Nyasaland, British Malaya, Jamaica, British Guiana, and West Africa. In Kenya and Uganda the coffee industry has assumed great importance, as is shown by the figures for the carriage of coffee over the Uganda Railway, which increased from 4780 cwts. in 1905-6 to 57,000 cwts. in 1915-16. A great part is grown on European plantations in Uganda, where 48,000 cwts. were grown in 1921, but attempts are also being made to encourage coffee-growing among the natives. In Kenya coffee is also under the control of European planters, and in 1919-20 the crop was estimated at 72,000 cwts. Here the climate and general conditions, so similar to those in the South Abyssinian highlands, are excellent, and it is expected that coffee-growing will take an increasingly important position among the industries of East Africa. In Nyasaland, on the west side of the lake, coffee is also cultivated to a small extent and attempts have been made to grow it in Tanganyika, where the Germans established plantations in the Kilimanjaro district. Here it was fairly successful, but in Usambara it was a failure, although much money was spent on the venture. In British Malaya more coffee is imported than exported, but it is grown extensively in Selangor, especially the robusta species, although the industry has diminished during recent years, owing to the attention that has been devoted to rubber. In Jamaica, on the other hand, some 64,000 cwts. were produced in 1921, and it is increasing as a crop. There are also considerable possibilities for coffee in British Guiana. Coffee has been grown, although without much success, in Queensland and Natal, in both of which countries its production has practically ceased.

Rubber.—No product has shown greater variations

in output and price during recent years than rubber. Periods of high price, when it seemed almost impossible to keep pace with the increasing demand for rubber, and during which all kinds of substances of every conceivable quality, good, bad, and indifferent, were put on the market as rubber, have been succeeded by periods of over-production, when the immense output of rubber could scarcely be sold and when only the best varieties were in actual demand. The over-production of the year 1918-1919 when, to take one instance, the Indian output increased from 2,605,000 lbs. in 1913-14, to 13,907,000 lbs., although the value only increased from £524,000 to £1,669,000, led to an almost total cessation, throughout many districts, of the wild-rubber industry; while the plantation industry was severely affected, and many estates had to restrict their output, and, in some cases, to cease production. One good result of the decreased demand and over-production of the past few years, however, has been that planters have been compelled to seek every means of producing only the best variety of rubber and to improve in every possible way the quality of their output, since the poor rubbers that were so eagerly bought a few years ago have become unsaleable; while the prodigal waste of the natural wild rubbers of Africa and elsewhere, which was leading to an almost total exhaustion, and in many cases destruction of the rubber forests, has almost entirely ceased. Natives who used to bring almost any kind of adulterated substance to the traders, after ruthlessly despoiling and frequently destroying the trees, are now unable to sell their produce, and as it no longer pays to collect the rubber there is some chance of the forests recovering their former fertility. Moreover, the era of low prices and plentiful supplies has led planters and manufacturers to seek for new uses for rubber, and experiments are being tried in many directions with a view to increasing the demand for the product. The uses of rubber are so many and varied, that it would seem almost impossible to produce too much, yet, as stated above, it has been found necessary to discover new avenues of consumption. One of the comparatively new uses to which it is being put is for street-paving and footpaths, for which it is expected that there will be a growing demand, and others are for stair-carpets, for

the soles of boots and shoes, for the manufacture of paints and varnishes, and for floors for houses.

The history of the rise and progress of the plantation rubber industry is one of the most romantic in the annals of commerce, and it is one in which British brains and British enterprise have been primarily responsible. Previous to the introduction of plantation rubber into Malaya and Ceylon, the greater part of our supplies of crude rubber came from the forests of the Amazon valley, or from the Congo regions of Africa. In the former the well-known tree *Hevea brasiliensis*, which now forms the basis of the greater part of the plantation industry was abundant, but as its habitat was confined to the forests of Brazil and the seeds could not be exported, it seemed almost impossible that a great plantation industry could be established elsewhere and the source of much of the world's rubber boldly transferred from the new to the old world. The project seemed particularly difficult, owing to the fact that the seeds do not remain good for long and that a previous attempt made in 1873, by Mr. James Collins, had been unsuccessful; for although plants were raised at Kew they died on transference to India. Three years later, however, Mr. Wickham (now Sir Henry Wickham), who may be regarded as the father of the plantation industry, succeeded in transporting some seeds to Kew, from which plants were raised and sent to Ceylon and to Perak in the Malay Peninsula. In his book on the *Plantation, cultivation, and growing of Para India Rubber*, Sir Henry Wickham gives a graphic account of how he overcame the difficulties that were in his way, how he chartered the steamer *Amazonas*, which owing to the disappearance of its crew had been left stranded on the Amazon; how he obtained the seeds of Para rubber, took them on board, successfully evaded the customs authorities at Para, and finally on June 14th, 1876, arrived at Liverpool with a precious cargo of seven thousand rubber seeds; and how finally 1,919 young rubber plants were raised at Kew. By this masterly handling of a very delicate business, Mr. Wickham successfully laid the foundations of one of the greatest industries of modern times, for the plants that were exported to Perak, Singapore, and Ceylon were the ancestors of the great plantations of rubber trees in the East.

As is well known, the prosperity of British Malaya is based upon rubber and tin. The mining industry is dealt with elsewhere, but it may here be said that the introduction of rubber largely displaced coffee and sugar, tapioca, indigo, and sago, and that the large number of rubber estates, many of which are very extensive, is one of the outstanding features of the peninsula. The value of the rubber exports from British Malaya rose from £124,000 in 1905, to £2,500,000 in 1909, and nearly £6,000,000 in 1910; but it has subsequently greatly decreased owing to the low prices now obtained. The total world's production of rubber in 1921, has been computed at about 432,000,000 lbs., of which about 239,000,000 lbs. came from Malaya, about 89,000,000 lbs. from Ceylon and India, about 9,000,000 lbs. from other British dependencies, and the remainder from the Dutch East Indies and other foreign countries. Of this enormous output the United Kingdom took about 6.3 per cent. and Canada and Australia about 3.7 per cent., so that the tropical British countries of the East are supplying the greater part of the world with its crude rubber. The sources of the rubber imported into Great Britain in the year 1920, to take a typical period, are, among foreign countries, the Dutch East Indies, where, however, many plantations are British-owned, and Brazil; and among British countries, in their order of importance, British Malaya (including Straits Settlements and Labuan) Ceylon, India, British Borneo, Gold Coast, Nigeria, Kenya, and Natal; with gutta-percha and balata rubber from British Guiana and the West Indies.

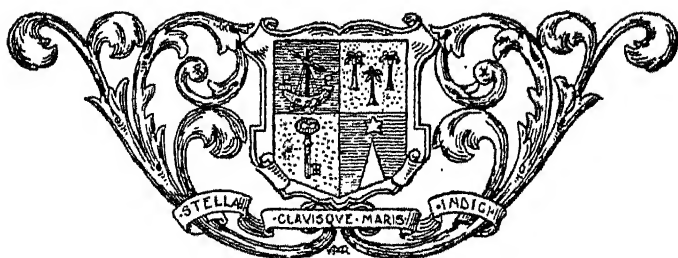
The greater part of the plantation rubber of the East is Para rubber, but other kinds are cultivated, especially in India where, in addition to Para, Ceara (*Manihot glaziovii*) is extensively grown, especially in the State of Coorg. Attempts have been made to cultivate the wild rubber of Assam (*Ficus elastica*), but the plantations are not large. In India there are two regions, enjoying very similar climate and a rainfall scarcely less favourable than that of Malaya, which pre-eminently offer possibilities for rubber-growing. These are the Tenasserim Coast in Burma, and the Malabar Coast from Mangalore to Cape Comorin. There is also a good deal of cultivation in Travancore and Cochin, frequently in

combination with tea ; but the main areas are in Burma. The exports of rubber from India in 1914-15 were 3,676,000 lbs., but in 1918-19, this amount had increased to 13,907,000 lbs., of which 79 per cent. went to the United Kingdom. In Ceylon the exports of rubber reached 93,000,000 lbs. in 1920.

Elsewhere in the British Empire rubber is mainly obtained from trees growing wild in the forests, although it has been planted in Kenya and Tanganyika, particularly the latter, and there are also small plantations in West Africa, especially in the Benin country of Nigeria and in the Cameroons. Both in Tanganyika and the Cameroons the Germans were seeking to establish a plantation industry, as their dependence upon foreign supplies of rubber was a very long-standing grievance with German manufacturers. In Tanganyika the variety preferred for plantation purposes was Ceara, and in 1912, nearly 88,000 acres were planted with this kind, chiefly along the railway from Dar-es-Salaam to Morogoro, in the Usambara district, and around Kilwa. These plantations suffered greatly during the war, but with a recovery of the rubber market there should be scope for a plantation industry in Tanganyika. In the Cameroons the plantations were largely in the districts now occupied by Great Britain and the variety chiefly planted was *Funtumia elastica*, generally known by its former name of Kickxia. Rubber of various kinds grows wild throughout the greater part of West Africa, Uganda, Nyasaland, and other African countries, and there was at one time a very considerable industry in collecting the rubber and shipping it to Europe. The result of the enormous demand that arose in the decade ending in 1912, was that much of the wild rubber was destroyed. "Latterly," states Major Cuthbert Christy, "owing to the very high prices prevailing, the quest of rubber has amounted almost to a frenzy, and a host of agents and middlemen waylay the native on his way to the markets. As a consequence adulteration has become more prevalent than ever. The native collector not only re-taps the already overtapped trees and small saplings, but he mixes with the good latex the produce of many laticiferous plants." ¹ The result in West Africa of this

¹ Christy, C., *The African Rubber Industry*, 1911.

indiscriminating haste to grow rich, coupled with the recent fall in prices, has been disastrous; and the flourishing rubber exports of the Gold Coast and Nigeria have very sadly diminished or entirely ceased. From the first colony rubber was first exported in 1880, and reached a maximum export of 6,000,000 lbs. in 1898. In 1920 only 299,000 lbs. were exported. From Nigeria, where the industry developed some ten years later, some 6,870,000 lbs. were exported in 1897, but the output is now insignificant and for the present, at any rate, the forest rubber industry in British Africa may be regarded as of no practical importance. In the same way in British Guiana, where wild rubber grows in considerable quantities, there are now no exports, while the exports of plantation rubber, chiefly Para, which had reached 20,000 lbs. in 1920, have dwindled to insignificant quantities. The balata industry, on the other hand, which in the year 1911, had become the third most important industry in the country, is still of considerable value. The average yearly export of balata during 1905-1909 was 655,000 lbs., with a yearly value of £72,000. In 1921 some 1,416,000 lbs. were exported, valued at £991,000, the greater part going to the United Kingdom. As balata grows all over the colony, it is an asset of considerable importance in a country where most other industries are not, at present, highly developed though of great potential value.



Arms of Mauritius.

CHAPTER XIII

FISHERIES

No food product, either of the past or of the present, has been of greater importance to the British Empire than the produce of the fisheries of the high seas. The work connected with the catching and bringing to the United Kingdom of the vast quantities of fish which have been consumed in the past (and the proportionate consumption used certainly to be very much greater than it is to-day) and are consumed at the present time, is probably our most ancient industry, for men were hunters and fishers before they were agriculturists, and they ventured upon the seas for the purpose of fishing long before there was any established exchange of commodities. Although fish cannot be regarded as one of the resources of the empire, seeing that the high sea fisheries are open to all comers and that no civilised nation claims exclusive privileges beyond the three miles limit, the fishing industry itself must be looked upon as one of our greatest assets. The race of hardy fishermen and seamen who have been trained for generations upon the North Sea, the Baltic, and the Atlantic Ocean, have formed the backbone of our Imperial navy, and the men of the mercantile marine and the Royal Navy to-day are the lineal descendants of the fishermen of the Middle Ages. In times of national stress they have given of their best to the service of their country, and the British fleets that have kept the seas both in the late and all previous wars have had to draw largely upon the fishing community for their personnel. It is difficult to imagine what England would have been without its fisheries, for just as wool was the staple industry of the land-dwellers, so fishing was the staple trade of that large amphibious population that built up the overseas prosperity of the British Empire.

Without entering into historical details it is difficult

to realise the great and almost predominating part that has been taken by fisheries in the rise and fall of maritime nations. When Benjamin Franklin wrote with poetic inspiration that "he who draws a fish out of the sea draws a piece of silver," he was uttering a truth upon which the prosperity of several nations has been founded, and when in the year 1436, the unknown author of that stirring poem entitled the *Libel of English Policie*, wrote his exhortation to Englishmen to keep the narrow seas, he too was uttering what was the foundation and basis and end of English policy:—

"The true processe of English policie
Is this, that who seeth South, North, East, and West,
Cherish Marchandise, keepe the adiniralitic;
That we bee Masters of the narrowe sec."

This has been the be-all and end-all of our national work, and to this end the fishing industry has contributed in no mean manner.

It is unnecessary, therefore, to labour so self-evident a truth in a book on the resources of the empire, but it may be said briefly that in war our fishermen are the bulwark of the nation as in peace they form the nursery of the Navy and that for centuries past, and it is to be hoped in the coming years also, the sea-fisheries will stand Great Britain in good stead, both as a means of defence and as a means for supplying our population with good and wholesome food. It is difficult to arrive at a conclusive estimate of the value of the sea-fish taken by British vessels and brought into the ports of Great Britain or even of the total value of the fish imported from foreign sources. In the year 1920, for instance, it is estimated that the catch by British vessels was worth nearly £30,000,000, while the output of the Canadian and Newfoundland fisheries was estimated at another £10,000,000. To these sums must be added, of course, the value of the large amounts of fish imported from foreign sources, such for example, as the tinned salmon from Japan, to the value of £3,150,000, canned sardines from France and Portugal, to the value of over £600,000, and all the other fish, fresh and canned, not of British taking, which were valued at some £9,497,000. The total value of our sea

fisheries cannot be less, therefore, than about £40,000,000, and when to this is added the product of the inland fisheries and of the great number of subsidiary trades that are dependent upon fishing, it will be seen that the fishing industry is one of the most important, and certainly one of the most valuable from the national point of view, of our imperial activities.

The fisheries of Great Britain include both an importing and exporting industry. During recent years, however, owing to unsettled conditions in Europe, there has been a decided slump in the exporting industry, for some of our best customers—Russia, for example—although they have continued to buy large quantities of fish, have been unable to take the amount of their pre-War consumption. Previous to 1913, the annual average quantity of wet fish—that is, of fish other than shellfish—landed from British fishing vessels was 1,165,000 tons, and of this amount about 40 per cent., consisting chiefly of herrings, was sent abroad. Although we have a canning industry of our own in Great Britain, and can principally herrings, we consume generally imported canned salmon and sardines, and “export the fish we can and import the canned fish we eat.” However, there is no reason why the overseas markets should not be greatly extended in the future; the search for new markets is meeting with some success, and there is evidence that there is an increasing demand for pickled herrings and for other products of the home fishing ports. These ports are scattered all round the coasts of Great Britain, but chiefly on the East Coast, and in their order of importance are the following: Grimsby, Aberdeen, Hull, Yarmouth, Lowestoft, Fleetwood, Lerwick, Milford, and London, with numerous smaller ports, such as Boston, Peterhead, Wick, and Swansea, directly dealing in fish. The fish that is brought into these ports comes from eighteen different European trawling grounds, ranging from the White Sea and coasts of Norway, the Baltic and North Seas, to the coasts of Portugal and Morocco, each of which is fished by organised trawling-fleets, bringing their produce to Great Britain. To these must be added the fishing grounds off Newfoundland and in the Gulf of St. Lawrence, a most important source of our food-supply, which have been regularly frequented by

European fishermen, French, Dutch, Basque, English, and Portuguese, since John and Sebastian Cabot landed on the shores of the new-found-land. Space will not permit of any description of the organisation on these fishing grounds, but it may be stated that in addition to the great numbers of trawlers, drifters, and larger vessels employed in the industry there are some 14,000 small fishing boats in England and Scotland, the crews of which earn their living mainly by inshore fishing. As a matter of fact, although the numbers of men employed in British fishing are not so large as those engaged in the Norwegian fisheries,¹ who are stated to number about 190,000, they are nevertheless a larger permanent body, as the latter include a considerable number who undertake fishing in conjunction with other occupations, such as small farming; and, as before stated, they form an invaluable imperial asset, just as the men of the old Dutch fleets, which in the middle of the seventeenth century were estimated to number 14,000 out of 16,000 ships then sailing the seas, served to keep alive the might of the Dutch Republic, until the fight for King Herring ended in the defeat of the Hollanders.

While the British fisheries, as such, are of such vast importance to the well-being of the empire, the great fisheries of Canada and Newfoundland, and the fisheries of other partners in the Britannic Commonwealth, are of very considerable value. In the case of Canada, it is estimated that some £12,000,000 are invested in the fishing industry, both in the actual fishing and in the canning and curing of the fish, while nearly 60,000 men are engaged in the sea fisheries, 10,000 in the inland fisheries, and nearly 20,000 in the canning and curing establishments. The total annual value of the Canadian fisheries is estimated at about £10,000,000, and while the Dominion itself is a great consumer of fish, the exports, mainly to the United States, Great Britain, and the West Indian islands are much larger. The principal fisheries of Canada are situated on the British Columbian coast, where there is a very large industry in canned salmon (to

¹ Professor J. S. Gardner had estimated the number of British fishermen at 125,000, and that the industry supports one-twentieth of the population, and has a capital sum of about £200,000,000 directly invested in it. Paper read before the Royal Geographical Society on March 8, 1915.

the value of nearly £3,000,000), and on the coasts of Nova Scotia and New Brunswick, where cod is the chief product. Similarly Newfoundland, with its great cod and other fisheries, is a most important centre of fishing, which may be said to be the great predominating industry of this Dominion. In 1921, for instance, the produce of the fisheries of Newfoundland and the adjacent coasts of Labrador (that is the fish actually landed in Newfoundland and exported thence), was estimated at £2,865,000, the greater part being sent to the United States; but this does not include, of course, the fish taken in the open seas and sent direct to England, the United States, and European countries generally. As a matter of fact, and of history, the fishing banks off the western coasts of North America, stretching northwards from Cape Hatteras to the coasts of Labrador, form the most important fishing region in the world, supporting the fisheries of Canada, Newfoundland, the United States, and other countries which send their ships to these areas. They are specially famous off the coasts of Nova Scotia and New Brunswick, particularly in the Gulf of St. Lawrence, on the western banks lying south-west of Nova Scotia, and on the Grand banks of Newfoundland, lying to the south-west of that island. In the river and gulf of St. Lawrence alone Canada possesses more than nine hundred miles of coast, along which are to be found, at different seasons of the year, a greater abundance and variety of fish than in any other part of America; and the shoals of cod fish, mackerel, and herring which approach the Canadian coasts for the reproduction of their species are immense. In addition the Dominion possesses a great asset in the inland fisheries of Ontario, Quebec, Manitoba, and British Columbia; and both the seal fisheries and whale fisheries are still of value, although these have been sadly depleted during recent years.

With respect to other parts of the empire it may be said that there are vast and at present almost unexploited fisheries which in the future will be supplying the southern Dominions and the teeming populations of the East with food. In the case of the whale fisheries these are becoming more and more restricted in area and capacity. The fisheries of South Georgia, which is a dependency attached to the Falkland Islands, produce large quantities of whale

oil (over £1,500,000 worth in 1921), but both the whale and the seal seem doomed to early extinction, unless drastic steps are taken to preserve them. The fisheries of South Africa offer great opportunities for the establishment of a fishing industry upon a large scale. It is estimated that the unexplored fishing region is about 90,000 square miles in extent, some large areas lying within easy distance of Cape Town. Any one who has witnessed the enormous shoals of fish preceding and following whales off Walfish Bay, when literally millions and millions of fish are to be seen, accompanied by countless thousands of sea birds, is able to realise the vast quantities of fish that exist around the African coasts. Farther north along the West African coasts there are other extremely valuable fishing grounds practically unused except by local fishers. These areas extend well to the north of the Cape Verde Islands.

In Australia although food fishes are abundant, the development of a fishing industry has been slow and considerable quantities of preserved fish are still imported into the Commonwealth. In Australia itself the annual consumption of fish per head of the population is only 10 lbs. against 42 lbs. in Great Britain, but it is hoped that with the establishment of State trawling in New South Wales an industry may be created in this and other States which will be of great direct benefit to Australia generally.

In addition to these food-fisheries a word must be said about certain special fisheries, such as the pearl fisheries of Australia, Ceylon, and the Persian Gulf, and the sponge fisheries of the Bahamas. The pearl-oyster inhabits the northern and western coastal waters of the Commonwealth from Cape York to Shark Bay, a distance along the shore of some 2000 miles, and a considerable industry has been established, especially in Western Australia, valuable both for the pearls and for the shell--the total output being worth about £400,000 in a year. The Ceylon pearl-fisheries have been noted for centuries, especially those in the Gulf of Manar, while the Indian pearl-fisheries of the Mergui Archipelago are also of some value. The great pearling districts, however, are to be found in the Persian Gulf, with exports of pearls exceeding in value one million pounds sterling annually. These

are chiefly in the neighbourhood of British protected islands, such as the Bahrein Islands, and they have been known since the dawn of history. The chief area for sponges outside the Mediterranean is the Bahamas, where there is a considerable industry in spite of the fact that the sponges generally are of poor quality.

In conclusion it may be stated that whilst the sea fisheries have been regarded in the past as inexhaustible, during recent years and specially since the war (during which it might have been expected that certain fisheries would have had a sufficiently long period of recuperation), there has been a decided shortage in certain fisheries, so that it would almost appear as though modern methods of fishing had appreciably reduced the enormous supplies. Certainly there has been a shortage of catch in the herring areas, and the troubles of the British fishing industry have been added to by this unexpected factor as well as by the difficulty connected with securing new markets. The latter problem, however, seems to be within reach of solution, owing to the development that is expected in the brine freezing of fish, as it has been discovered that fish can now be frozen successfully by being plunged into a liquid like brine, reduced in temperature to 20 or 30 degrees below freezing point. The old process of freezing was unsatisfactory, but once this method of brine-freezing is established the export of British frozen fish to many parts of the world should increase rapidly, and probably the fisheries of British Columbia would also be able to supply fresh salmon instead of the canned variety.

CHAPTER XIV

MEAT AND DAIRY PRODUCTS

THE overseas portions of the British Empire, and particularly the Dominions, are one of the largest sources of the meat and dairy supplies consumed in the United Kingdom, and their continued prosperity depends in great measure upon the organisation of their markets and an increase in the supplies of animal products imported into this country. Every one realises, of course, that Canada, Australia, and New Zealand, and, to a lesser degree, South Africa and Rhodesia, in addition to being one of the chief sources of our cereals, are supplying vast quantities of meat and dairy produce to the home markets. It is difficult to arrive at an exact estimate of the total consumption in Great Britain of all the animal products of our Dominions and Colonies without taking into consideration certain materials, such, for example, as casein, a milk product now extensively manufactured in New Zealand; but the following table gives approximately the position as it was in 1921, and shows the enormous demands of the home markets for animal products:—

IMPORTS INTO THE UNITED KINGDOM

COMMODITY.	FROM FOREIGN COUNTRIES. £	FROM BRITISH EMPIRE. £	TOTAL. £
Beef, all kinds	36,587,000	8,362,000	44,949,000
Veal, all kinds. .	543,000	66,000	609,000
Mutton and lamb, all kinds	10,884,000	18,770,000	29,654,000
Pig products ..	48,695,000	6,963,000	55,658,000
Rabbits ..	31,000	537,000	569,000
Others, all kinds	771,000	60,000	831,000
Poultry and game	598,000	28,000	626,000
Total meat imports	98,109,000	34,787,000	132,896,000

IMPORTS INTO THE UNITED KINGDOM—*Continued.*

COMMODITY.	FROM FOREIGN COUNTRIES.	FROM BRITISH EMPIRE.	TOTAL.
	£	£	
Living animals	1,558,000	1,245,000	2,803,000
Leather, dressed and undressed	5,842,000	2,502,000	8,344,000
Eggs, all kinds	14,086,000	1,702,000	15,788,000
Milk, all kinds..	9,060,000	2,243,000	11,303,000
Cheese, all kinds	1,532,000	15,914,000	17,446,000
Butter	21,598,000	20,741,000	42,339,000
Total animal pro- ducts (exclus- ive of wool, etc.)	151,785,000	79,134,000	230,919,000

It will be seen that the total of animal products of all kinds, with the exception of wool and of certain minor substances, such as bones, cascin, and others, entered for consumption in 1921, was valued at £230,919,000, of which a little more than 65 per cent. came from foreign sources, and a little less than 35 per cent. was sent from British countries. In view of the almost unique opportunities for the Dominions to supply the mother country with meat and other animal products, it cannot be regarded as altogether satisfactory that the United Kingdom should continue to draw such large quantities from foreign countries. It is this question that has recently engaged the attention of the Dominion Governments, with the result that there has been a systematic endeavour in certain Dominions, Australia and New Zealand in particular, to organise the marketing of their products so that they may be in a position to compete with, and beat on their own special ground, the supplies that at present come so largely from foreign sources. The Dominions especially desire to develop their meat trade so as to render this country independent of the great foreign corporations that have acquired so strong a hold over the British markets. It does not matter, of course, from the economic point of view, whether our supplies of meat come from the Argentine or from Australia or New Zealand, so long as the sale of British

manufactures is increased proportionately in these countries, but from the political and strategic point of view it is highly desirable that the home meat market should be as independent as possible of foreign supplies. The advantage to the empire generally of increasing its meat and other industries by developing the great agricultural lands of the Dominions, and attracting thereto a constant flow of immigrants, is sufficiently obvious without further comment.

An examination of the above figures reveals the fact that in three classes of products the overseas empire supplies the mother country with more than, or nearly as much as, comes from foreign countries, viz., cheese, butter, and mutton and lamb. In all the others, the Dominions are beaten by foreign competitors. The extraordinary increase in the products of the dairy received from the Dominions during recent years, demonstrates that when an industry is not controlled by great combines of capital it is possible to capture the British market, wherever quality and other conditions are equal; and it is certainly desirable that a similar development should take place with regard to the frozen meat trade and the trade in bacon, eggs, leather, and other animal products.

Two of the Dominions have taken recently decisive steps to place the marketing and organisation of their meat products upon a more satisfactory basis. In the case of New Zealand, which supplies the mother country with vast quantities of frozen mutton and lamb, as well as a considerable amount of frozen beef, there has been formed, under the Meat Export Control Act of 1921-1922, an organisation known as the New Zealand Meat Producers' Board, which, while it is not controlled by the government, is, in fact, backed up by it. The main object of this body is the strengthening and extension of the sales of New Zealand meat in Great Britain and elsewhere by watching the grading and packing of the meat, and by seeing that the producer gets value for his produce and is not fleeced by the inordinate demands of the middleman. That some movement of this kind has long been necessary has been evident to all who have studied the prices paid to the producer and the prices paid by the consumer. The example set by New Zealand

meat growers in forming a national organisation has been followed by Australian interests. The extreme depression in the cattle-raising industry in the Commonwealth, and the fact that for nearly three years producers have been selling their cattle at below cost price, led the Australian Government to create a Meat Council which would act as an advisory board to the administrative authorities. The serious position of the industry—of deep significance so far as empire development is concerned—may be judged by the fact that the Australian Government were obliged to grant a subsidy of 6s. per 100 lbs. of meat, and that the South African Government had to authorise similar bounties in order to keep the industry going. The Australian Meat Council is assisted by a local board in each State, and its duties are generally to supervise methods of grading and refrigeration, to improve facilities for shipping and unloading, to arrange for displays of Australian meat, and other forms of propaganda, and especially to extend the markets for Australian meat. One of its main endeavours is to secure some measure of protection in the British market for Australian raw products, and it has been suggested recently that a Board should be formed in this country to supervise the import of meat under licence, so that the amount to be imported from British and foreign countries can be adequately controlled.

The annual average value of frozen beef exported from the Commonwealth during the five years 1917-21 was £3,482,000, and of mutton and lamb, £2,070,000, but it is evident that these amounts, especially so far as beef is concerned, do not represent the full possibilities of the British and other markets. In the case of Canada, with its colder climate, there can be no expectation of a large trade in frozen mutton, but the beef exports, already considerable, should be extended, and the great Canadian industry in supplying bacon and hams could doubtless be increased largely at the expense of the United States. When it is realised that bacon to the value of over £37,266,000, and ham to the value of over £7,560,000, came from foreign countries, mainly the United States, in 1921, and bacon and ham to the value of some £6,917,000 only from the Dominions,

chiefly Canada, it is evident that there is room for expansion.

The problem of imperial meat interests, in common with other food products, has been considered recently by a Departmental Committee, presided over by Lord Linlithgow, and following the report of a Committee on Trusts, which pointed out in 1919 the "serious consequences that might ensue to British producers and consumers alike if the proportion of beef imported from non-Empire countries were increased," has recommended that the "ramifications of the large importing houses should be kept under constant observation," and that an Imperial Meat Council should be formed in order to guarantee prices to overseas producers and for other important purposes. We cannot follow this question further than to emphasise the extreme importance of supporting the meat industries of our Dominions, so as to enable them to be carried on at an adequate profit in the face of foreign competition.

The great pastoral areas of the British Empire are situated in Australia, New Zealand, South Africa (and Rhodesia), and Canada, among the Dominions, and the Sudan, Kenya Colony, and Nigeria, among the Colonies ; but the latter, although presenting great possibilities as cattle and sheep countries, are, at present, practically undeveloped for purposes of export, although in the Kenya Colony some progress is being made in the high-land country in the establishment of flocks and herds. So far as the cattle industry is concerned, Australia and Canada lead the way. In the Commonwealth, Queensland is the chief cattle State, and the coastal belt and land near the Gulf of Carpentaria, as well as the extreme west of the State, support large herds of cattle, which are driven to the coasts for slaughter and refrigeration at the large works established at convenient points. Freezing works have been erected at Townsville, Bowen, Brisbane, and Rockhampton, all convenient places for export. The total number of cattle in the State is estimated at about six and a half millions, New South Wales coming next with about three millions. In the latter State, the abattoir of the Metropolitan Meat Industry Board at Homebush Bay is the largest concern of its kind in the world, and is in many respects a model

of organisation. Elsewhere in Australia the cattle industry is not so large, although Western Australia is making considerable progress. In addition, the trade in frozen sheep is very large, and in this respect New South Wales and Victoria are the leading States. The total value of mutton, lamb, and beef exported from Australia in 1920-21 was £5,397,000. So far as these industries are concerned, there is almost unlimited scope in the Commonwealth, where, in addition to the thinly occupied areas, there are vast unpeopled spaces available in the Northern Territory and the northern portions of Western Australia, which are specially suitable for cattle. In these two countries, freezing works have been established at Windham, Carnarvon, and Darwin. Next in importance as a cattle country comes Canada, which exports large quantities of frozen beef to the United Kingdom, and smaller amounts to the United States, as well as great numbers of living cattle for slaughter, and, recently, for store purposes. Quebec and Ontario are great cattle provinces, followed by Alberta and Saskatchewan, where the immense open prairies could support vast herds, as they did when they were roamed over by countless hosts of bison. In this connection, it is interesting to note that it has been suggested recently by Stefannson that a great part of Northern Canada could be utilised for bison and reindeer, and that a large meat industry could be established if these animals were properly protected and conserved. In New Zealand the cattle industry is subsidiary to the trade in frozen mutton, but the country possesses as many cattle as New South Wales, and the exports are considerable. In South Africa, the eastern coastal areas of the Cape Province and Natal form the principal cattle lands, but great ranches have been established in Rhodesia which will undoubtedly become a considerable meat producing country. With regard to mutton and lamb, New Zealand holds the first place, being closely followed by Australia as an exporting country. Victoria and New South Wales have great freezing works at Portland, Footscray, and Geelong in the former State, and at Forbes, Parramatta, Leichhardt, Auburn, Grafton, and Waterloo in the latter, each capable of handling large numbers of sheep daily.

In addition to the meat industry, the dairying industry has assumed vast proportions in New Zealand, Australia, and Canada, from which countries come more than three-fifths of our overseas supplies of these products. New Zealand especially has made great progress as an exporter during the past few years, and easily leads in the exports of cheese, though Australia exports more butter. Canada sends comparatively little butter to the mother country, but is a large exporter of cheese, and the dairying industries form a most important part of the mixed farming practised in south-western Ontario, Quebec, Manitoba, and Nova Scotia. There is also a great trade in condensed milk, but chiefly to the United States, which provides a very large market for all Canadian dairy products. With regard to condensed milk, it is perhaps singular that the Dominions do not at present send large quantities to Great Britain compared with the amounts imported from foreign countries; but progress is being made, particularly in New Zealand, where a considerable industry has been established in the dried milk known as glaxo. With regard to minor products of the farm, such as eggs and poultry, there seems to be ample scope for the organisation of an extensive trade in view of the fact that the United Kingdom spent £15,789,000 on imported eggs of all kinds in 1921, of which only a comparatively small amount came from the Dominions. The trade in imported eggs from British countries is increasing, and probably better organisation of this industry, as well as of other food products, might lead to a reversal of the present situation.

CHAPTER XV

MINERAL RESOURCES OF THE EMPIRE

WITH few exceptions, the British Empire contains all the minerals that are required in connection with the industries of the United Kingdom, the Dominions, and India, and of certain worked minerals it either has a practical monopoly or supplies a very considerable proportion of the world's output. The position, therefore, is highly satisfactory from the British point of view, because the immense resources of the empire in minerals, at present only partly developed, are an economic asset of great importance in connection with the expansion of British trade throughout the world. Just as the prosperity of England as a manufacturing country has been due in large measure to the presence of coal in the United Kingdom, so the prosperity of certain overseas portions of the empire has been brought about, in considerable degree in certain areas, by the discovery of gold and other minerals in country that was of purely agricultural or pastoral value. This is especially true of South Africa and Australia, and to a lesser degree of other parts of the empire, while the occurrence of the more useful minerals in various Dominions and Colonies has become an important factor in their development now that these Dominions have entered the manufacturing sphere on their own account.

In the report of the Dominions Royal Commission, considerable attention has been devoted to the mineral resources of those portions of the empire. As this report illustrates the position with regard to these resources, and emphasises more particularly the prevailing conditions respecting their exploitation and distribution previous to and during the war, we shall briefly summarise the conclusions of the commission on this important topic.

With the opening of the war, considerable attention

was naturally devoted to those minerals that were of special value in connection with the hostilities, and it was found that in certain cases contracts existed with German companies by which a very substantial control of many important minerals had been obtained by the leaders of German industry. In the case of Australia, it was discovered that German companies had obtained contracts covering nearly the whole of the Australian output of copper, lead, and zinc, and drastic measures were taken to put an end to this state of affairs. Consequently, early in 1915 the Commonwealth Government passed legislation annulling those contracts that had been made in Australia, and similar action was taken by the Imperial Government in the following year. The measures thus enforced resulted in the establishment of a Metal Exchange in Australia, empowered to register the sales and purchases of base metals and minerals for export or for consumption beyond the Commonwealth, and the Proclamation prohibiting the export of metals without the consent of the Minister for Trade is still in force and control over their exportation is exercised through the agency of the exchange. This measure was one of very great importance, and it illustrates a form of governmental control which is of the utmost value in time of war and which, under certain conditions, may be applied in time of peace. At the same time the Commonwealth Government adopted the policy of securing, so far as possible, the refining within Australia, or in British and allied countries, of all Australian base ores, and steps were also taken to establish an iron and steel industry on a large scale by the Broken Hill Proprietary Company, which commenced operations early in 1915, at Newcastle, in New South Wales, and has been manufacturing on a very large scale. Certain difficulties which have occurred in connection with this industry need not be touched upon here; but the Broken Hill Proprietary Company have demonstrated that Australia is capable of maintaining a large iron and steel industry—a factor of great importance in connection with the industrial development of the Commonwealth.

Similarly in India at the outbreak of the war certain minerals were almost exclusively controlled in Germany. Thus tungsten, which is necessary for the manufacture

of high-class steel, was sent to Germany for metallurgical treatment, while zinc was chiefly exported to Antwerp and Hamburg in the form of ore for conversion into spelter; chromite, used in the manufacture of ferro-chrome and chrome steel, went to Hamburg, whence it probably found its way to Essen; and monazite from the monazite sands of Travancore was also controlled by Germany. In Canada also, steps were taken to secure full British control of the available supplies of molybdenite, and elsewhere throughout the empire, wherever German interests had secured or were obtaining a stranglehold on mineral output, effective steps were taken to eliminate this dangerous feature of modern industrialism. In connection with the nickel industry of Canada, which produces 80 to 85 per cent. of the world's supply of nickel ore, measures became necessary to supervise the destination of the ore exported from the Dominion to the United States, where it was refined, and steps were taken to secure the refining of the metal within Canada, and similar measures were enforced in connection with zinc, the whole output of which from British Columbia crossed the border in order to be smelted in the United States.

The Dominions Commission, after reviewing the whole situation, came to the conclusion that the joint representations of the Institute of Metals, the Institute of Mining Engineers, and the Institute of Mining and Metallurgy for the systematic collection and co-ordination of information bearing on the use of minerals and their production, and the investigation of all questions and problems relating to the utilisation of the mineral and metallurgical resources of the empire, were worthy of very careful consideration. In particular, they stated that it was of the highest importance to ascertain whether workable deposits exist of such minerals as quicksilver, platinum, borax, and potash, "which at present are obtained almost solely from foreign sources," and also to take steps, wherever such minerals occur in conjunction with other ores, to secure their recovery. As the outcome of these recommendations and of the debates at the Imperial Conference of 1917, a committee was formed to inquire into the needs and resources of the empire, and the best means of developing them, and this body formed the nucleus of the Imperial Mineral

Resources Bureau, which received its Royal Charter in 1919, and has performed a notable service by issuing a most valuable series of reports on the mineral resources of the world, and more especially the British Empire, and in gathering together and furnishing information on this subject. As this Bureau is of very great economic importance, especially when considered with reference to the valuable work of the Imperial Institute in connection with minerals, it may be well to indicate briefly its constitution and functions. The Bureau is essentially an imperial body, and not a government office, and consists primarily of twelve Governors, who include representatives of India, the Dominions, and Colonies, and members nominated by certain Ministries and technical institutions. From this body, certain committees, with co-opted members, are formed, who are assisted by about 150 correspondents working in this country and abroad. The committees represent both the user, the producer, and the scientific man, and are aided by technical advisory committees for each of the important minerals, and for the industries dependent upon them. In the preparation of the monographs dealing with our mineral resources, in classifying confusing trade names, in keeping lists of firms dealing with specific minerals, in safeguarding and furthering the interests of smaller and lesser known minerals, and adjudicating between colonies whose mineral industries tend to clash, the Bureau may be said to be linking the empire upon a commercial basis, and is thus carrying out in no small measure the functions first suggested in the report of the Dominions Commission.¹

It will be interesting here to examine the position of the mineral industry before and after the war, with a view to discovering the principal sources of supply of certain minerals, and of determining what share the British Empire takes in their output. The following figures are based upon a Statistical Summary prepared by the Imperial Mineral Resources Bureau, and they show, so far as possible, the percentage of certain minerals obtained from within the British Empire and from foreign countries—the percentages representing the

¹ From a lecture by Prof. W. T. Gordon at the Royal Colonial Institute, on February, 24, 1922.

total world's output so far as it is shown in these figures :—

MINERAL OR METAL.	BRITISH EMPIRE PERCENTAGE.		FOREIGN COUNTRIES PERCENTAGE.		PRINCIPAL PRODUCER, FOREIGN OR BRITISH, IN 1919
	1913	1919	1913	1919	
Aluminium,	19	12	81	88	United States Canada
Asphalt,	36	46	64	54*	Trinidad Venezuela
Asbestos	87	95	13	5	Canada Russia
Barium,	29	24	71	76	United Kingdom United States
Bismuth,	28	27	72	73	Australia Bolivia
Borates,	0	0	100	100	United States
Chromite,	54	85	46	15*	Rhodesia Greece
Cobalt	47	100	53	0*	Canada
Copper,	10	6	90	94	United States Canada
Felspar	30	82	70	18	United Kingdom Sweden
Gold,	60	64 (1918)	40	36 (1918)	South Africa United States
Graphite,	22	6	78	94*	Ceylon Austria
Gypsum,	24	18	76	82*	United States Canada
Iron ore,	10	14	90	86	United States United Kingdom
Lead,	12	18	88	72	United States Australia
Magnesite,	7	16	93	84	United States India
Manganese,	36	53	64	47	India Brazil
Mica,	37	66	63	34*	Canada and India United States
Molybdenum,	91	99	9	1*	Australia Mexico
Monazite,	46	93	54	7	India Brazil

MINERAL OR METAL.	BRITISH EMPIRE PERCENTAGE.		FOREIGN COUNTRIES PERCENTAGE.		PRINCIPAL PRODUCER, FOREIGN OR BRITISH IN 1919
	1913	1919	1913	1919	
Nickel,	69	90	31	10	Canada New Caledonia
Nitrates,	0.6	1	99.4	99	Chile India
Petroleum,	3	3	97	97	United States India
Phosphates,	8	4	92	96*	United States Nauru Island
Pyrites,	5	7	95	93*	Spain Canada
Quicksilver,	0	0.2	100	99.8	Spain New Zealand
Silver,	21	20	79	80*	Canada United States
Sulphur,	0	0	100	100	United States
Talc,	4	8	96	92*	United States Canada
Tin,	53	69	47	31*	Federated Malay States Bolivia
Tungsten,	41	68	59	32*	India Bolivia
Uranium,	2.8	0	97.2	100	United States United Kingdom
Vanadium,	0	0	100	100	United States
Zinc	7	8	93	92	United States United Kingdom

*Where marked with an asterisk the figures are incomplete, and the proportions are subject to amendment.

With these introductory remarks it will be well to consider in detail the principal minerals of the empire, to describe their occurrence, and, so far as possible, to indicate briefly the progress that has been made in the industry; but before doing this, we shall summarise the present mineral production of the Dominions and India. In the case of Canada, the British Empire contains a Dominion of the greatest industrial importance, whose manufacturing output is even now a considerable factor in the national life of the country, and competes

actively, and will do so in a much greater degree in the future, in certain directions with the older established industries of the mother country. These industries are largely dependent upon the mineral resources and water-powers of the Dominion. For many years a Geological Survey, and, more recently, a Department of Mines in addition, have been tabulating and collecting information regarding the wonderful mineral wealth of Canada, and the reports issued by these bodies form a most valuable series of monographs on the geology and minerals of the country. In addition to these bodies, the Provincial Departments of Mines, especially that in Ontario, have issued extremely valuable reports, those of Ontario ranking in importance and interest with the monographs published by the Geological Survey and the Dominion Department of Mines.

At the present time the total annual value of the metal and mineral production of Canada is in the neighbourhood of £37,000,000 (1920), exclusive, of course, of the value of manufactured articles; and includes among the metallic minerals, in their order of value, nickel, gold, copper, silver, lead, zinc, cobalt, and iron, and among the non-metallic minerals, coal, asbestos, natural gas, and gypsum. Many other minerals are produced, of course, such as molybdenite, platinum, tungsten, arsenic, graphite, mica, talc, and petroleum; but, on the whole, the mineral industry is chiefly founded upon the minerals first mentioned.¹

The quite extraordinary position of Canada with respect to mineral supplies has been well illustrated in the presidential address of Dr. C. V. Corless to the Canadian Institute of Mining and Metallurgy in 1922. He said: "We live in a country whose greatest permanent material sources of wealth are its soil and its minerals. But few

¹ The figures of production in the year 1920 were as follows:—

Nickel	....	....	\$24,534,000	Asbestos	....	....	\$14,734,000
Gold	....	....	15,814,000	Natural gas	....	....	4,232,000
Copper	....	....	14,244,000	Gypsum	....	....	1,893,000
Silver,	....	....	13,490,000	Petroleum	....	....	822,000
Lead	....	....	3,214,000	Magnesite	....	....	512,000
Zinc	....	....	3,057,000	Arsenic	....	....	447,000
Pig Iron	....	....	2,066,000	Mica	....	....	376,000
Cobalt	....	....	1,365,000	Talc	....	....	166,000
Coal	....	....	80,693,000				<i>and others.</i>

people realise, however, that not more than about 15 per cent. of the entire surface is suitable for profitable cultivation. Of the two largest provinces generally considered as mainly agricultural, the proportion is probably less than ten per cent. I shall endeavour to show that the remaining eighty-five per cent. contains mineral treasures of inconceivable value." Such words coming from so eminent an authority are, we think, conclusive evidence of the enormous latent possibilities of Canada, and when it is remembered that it is only comparatively recently that substantial progress has been made in the mineral industry of the Dominion, the great area of untapped and even unknown deposits will be realised. Silver was not discovered in the Cobalt area until 1903; gold was not found in the Porcupine region until 1909; and many other rich deposits of minerals have only recently been worked. In fact, in spite of the extensive and prolonged investigations of the brilliant group of geologists who have been reporting to the Dominion and Provincial governments, the worked areas, and even the known but unworked deposits, form only a very small fraction of the probable mineral riches of Canada.

Geologically, Canada is one of the most remarkable regions on the surface of the globe. It contains what is conceded to be the greatest single exposure of basement formation on the earth's surface, the great pre-Cambrian Laurentian shield extending far south, and nearly surrounding Hudson Bay, an area approximately 2,000,000 square miles in extent, or over half the total area of the Dominion. For many years geologists have pointed out this vast region as the depository of immense mineral wealth, and recent developments have proved abundantly the correctness of these forecasts, and have demonstrated that in addition to the worked areas, there exist in the far north vast supplies of minerals which even the most pessimistic will admit to be capable of development whenever the necessary communications over barren and inhospitable wastes have been established. On the opposite side of Canada, the great region extending from the foothills of the Rocky Mountains to the Pacific Ocean is another vast area, containing approximately 550,000 square miles, which is everywhere highly

mineralised. The discovery of gold in British Columbia in 1859 first directed attention to the possibilities of this zone, and the boom on the Klondike in 1896 is familiar to every one. What is not so well known is the fact that the richly mineralised areas of the western United States extend right up into the Arctic, and that rich and immense stores of coal, iron, and many other minerals are awaiting development all along the Pacific littoral. The present mining development of British Columbia, worth £7,600,000 in 1920, is only a fraction of what may be anticipated from this region alone. Finally, with regard to Canada, there is the mineralised area in the Maritime Provinces of Nova Scotia and New Brunswick, and in the eastern portions of Quebec, where considerable development has already taken place, especially in Nova Scotia.

With respect to specific minerals, a few brief particulars are requisite. The coal resources of the Dominion compare favourably with other coal-mining countries in quantity, quality, and mining facilities, but owing to the fact that the more important deposits are in the eastern and western portions of the Dominion, coal importations are received in central Canada from the United States. This, however, is a fact due to distribution and not to any lack of coal, for it has been estimated that there is in the Dominion a reserve of 1,216,000,000,000 tons of coal—an enormous total that can only be illustrated by explaining that roughly it is nearly 60 per cent. greater than the total estimated supplies of all Europe, and represents one sixth of the total estimated supplies of the whole world. Of nickel, Canada possesses enormous deposits in the Sudbury and Cobalt districts of Ontario, which between them supply about 80 per cent. of the world's requirements. Of cobalt, about a similar percentage is supplied from the latter district, and the greater part of the world's supply of corundum is also produced in the Dominion, chiefly in eastern Ontario. Similarly in 1917, Canada became the world's greatest producer of molybdenum, although the present output is inconsiderable, obtained from the molybdenite deposits in Ontario, Quebec, British Columbia, and Nova Scotia, while zinc is rapidly becoming an important product in British Columbia, and exists

in other parts of the Dominion, particularly the Sudbury district. These, with gold, silver, and platinum, are only a few of the exploited riches of Canada, and up to the present the only mineral that has not come up to expectations is iron, which, although present in considerable quantities in nearly every province, is not sufficiently high grade to compete successfully with the better deposits of the United States. Many great iron areas have, however, been located, their estimated contents being some 600,000,000 tons; but of the iron ores smelted in Canada, only a small percentage (about 7 per cent.) is smelted from Canadian ores, and the blast furnaces of Sydney (Nova Scotia), Hamilton, Sault Ste. Marie, and on the Pacific coast, are at present mainly concerned with United States ore.

Turning our attention to South Africa, the position is also one of extraordinary interest, because the prosperity of the Union has been dependent in a very large degree in the past upon the exploitation of its mineral riches. The discovery of diamonds at Kimberley, and of gold on the Witwatersrand—the immensely rich reefs which form the foundation of the watershed between the Limpopo and Vaal basins—contributed in a marked degree to the development of the country, attracted capital and industry, induced agricultural settlement, and served to render South Africa a name synonymous with mineral riches. The total value of the minerals extracted in South Africa up to the end of 1921 has been estimated to be upwards of £1,000,000,000, of which nearly four-fifths have come from the Transvaal, mainly in the form of gold from the Witwatersrand. During the past seven years the average annual value of the minerals extracted in the Union has been over £56,000,000, of which much the greater part has been exported. This sum is far in excess of the exports of agricultural and pastoral products, and demonstrates the fact that much of the prosperity of the Union is based upon the success of its mines. Of the minerals mined within the Union, the most important in their order of value are gold, coal, diamonds, copper, silver, tin, and asbestos, but others, such as corundum, graphite, osmiridium, zinc, and talc are also mined; while barium, bismuth, chromium, cobalt, quicksilver, molybdenum, nickel,

platinum, thorium, titanium, tungsten, vanadium, and other of the rarer minerals have either been worked or their presence noted. With regard to iron, many valuable deposits have been brought to light, and smelting works are being established, or are already working, at Pretoria, Vereeniging, and Newcastle (Natal). There seems little reason to doubt that eventually a considerable iron industry will be established, more particularly as the iron is in close proximity to the extensive coal deposits, which in some districts actually overlie or mingle with the great gold areas of the Transvaal.

In Australia also, as is well known, the mineral industry had played a predominant part in the development of the Commonwealth, which until the year 1851 was a slowly moving pastoral country that seemed destined to export wool and agricultural produce, but did not offer any encouragement for the establishment of other large industries. In that year, however, an event took place which has been picturesquely described as "precipitating Australia into nationhood," for the existence of gold, known for some time before that date, became fully established by the discoveries of Edward Hargraves near Bathurst, in New South Wales, and the magic keys that opened the doors of the continent were soon in the hands of many thousands of immigrants who flocked to the Victorian and New South Wales goldfields. Here certain districts, such as Bathurst and Mudgee, and especially Ballarat and Bendigo, became important centres of mining activity, famed as much for the remarkable size of the nuggets found as for the great quantities of gold extracted from the alluvial. Subsequently the discovery of the great fields in Western Australia, especially at Coolgardie and Kalgoorlie, led to another wave of prosperity.

Australia is very rich in minerals, and enormous developments have taken place which will be alluded to in subsequent paragraphs. It is computed that the value of the gold produced in Australia since 1851 has been £605,000,000—an amount closely approximating to the total produced in South Africa, viz., £717,000,000. In addition to gold, however, other valuable minerals, such as silver and copper, have contributed their share to the national wealth, the value of the products of the

celebrated Broken Hill mines alone being estimated at £106,000,000. Of the minerals produced in the Commonwealth, the following are the principal in their order of value: coal, gold, copper, iron, silver, lead, zinc, magnesite, wolfram, scheelite, and bismuth; while the rarer minerals, such as platinum, and opals, the latter mainly from Queensland and New South Wales (where the Wallangulla field is stated to be the only place in the world where the "black" variety of the gem has been found) are also mined in considerable quantities. From a commercial point of view, the most important deposits in the Commonwealth are iron and coal, upon which the future manufacturing prosperity of Australia will depend, and in both these essential minerals the Commonwealth is extraordinarily rich, and great developments have already taken place. The industrial future of Australia, like that of Canada, is largely concerned with these two minerals; but whereas in Canada iron has not hitherto played an important part, the contrary is the case in the sister Dominion. In Australia, coal is a predominating factor in its economic development in view of its comparative poverty in water resources, upon which the economic prosperity of Canada so largely depends.

In New Zealand there are also great mineral resources, but the country has been described as a mineralised rather than a mineral region, for although it is stated that in no other country of equal size are indications of a greater number of economic minerals to be found, yet, with the exception of iron-ore, the known mineral resources are not great in comparison with those of many other countries. Like Canada, the power resources of New Zealand are very large. This will be an important factor in the national development, for the life of the coalfields has been estimated at under one hundred years, and may possibly be less, and it will be necessary to utilise the great reserves of water power from the mountain rivers and streams.

The total value of the mineral output of New Zealand since the year 1853 has been estimated at about £122,000,000, of which gold accounts for £88,000,000, and coal for £30,000,000. This amount is inconsiderable, of course, when compared with a country like South Africa,

but it represents an important national asset in a land which otherwise would be of purely agricultural and pastoral value. In addition to gold and coal, the following minerals are worked: silver, tungsten, manganese, antimony, chrome-ore, copper, quicksilver, hematite, and crude sulphur. The deposits of iron-ore are large, but estimates of their extent are at present inconclusive. Additional to the above minerals, deposits of the following have either been worked or located: tin, platinum, petroleum, and greenstone (the "pounamu" of the Maories).

The only other parts of the empire that need be considered here in connection with mining are Newfoundland and India. With the exception of the iron mines at Bell Island, comparatively little is known regarding the mineral wealth of our oldest colony. Both investigation and development had been greatly neglected in the past, and it is high time that a really comprehensive survey of Newfoundland should be made, so that its mineral resources, which are certainly large, may be made known. So uncertain is the information about Newfoundland, that estimates varying from 500,000,000 tons of coal (made at the Geological Conference in Toronto, 1913), and 2,000,000 tons of mineable coal, made by Captain E. J. Edwards, have been seriously advanced. In the face of such conflicting evidence, it is, of course, impossible to come to any definite opinion. The principal minerals in Newfoundland that have been worked or are being worked are iron, lead, and copper, but there are also known deposits of pyrites, chromite, manganese, molybdenite, gold, silver, and certain other minerals. The copper deposits are reported to be large and valuable, as well as the chromite areas, and there are also extensive areas of oil shales.

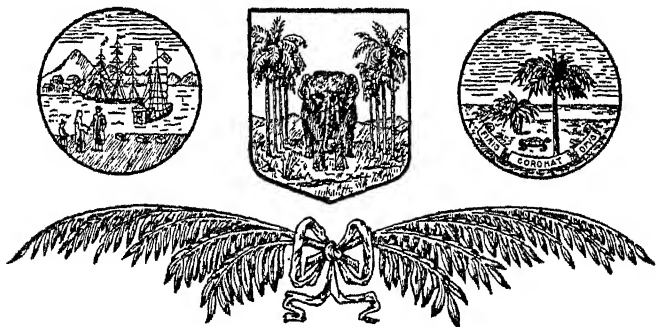
India, in spite of its immense size and the antiquity of its mineral industries, can hardly be described as a highly mineralised region. More than two thousand years ago Megasthenes wrote that India "has underground numerous veins of all sorts of metals, for it contains much gold and silver, and copper and iron in no small quantity, and even tin and other metals which are employed in making articles of use and ornament,

as well as the implements and accoutrements of war.”¹ Writing on the economic value of such deposits, V. Ball in 1881 stated that “to many it may appear that it was a fanciful and fabulous India. . . . Were India wholly isolated from the rest of the world, or were her mineral productions protected from competition, there cannot be the least doubt that she would be able, from within her own boundaries, to supply very nearly all the requirements, in so far as the mineral world is concerned, of a highly civilised community. But the consumer would probably have to pay more than he does at present.” This statement sums up in a nutshell the then economic position of the mineral industries in India, and it is still true, substantially, at the present time, although considerable advance has been made in establishing metallurgical plants upon modern lines, such as the gold milling and reduction plants of Kolar, and the Barakar Iron Works, which have succeeded in producing pig-iron at a profit. On the whole, however, Indian metals are still extracted, as they have been for thousands of years, by primitive and wasteful methods, and cannot compete, therefore, with the highly specialised and scientific organisation of the metallurgical industries of other countries.

One result in India of the war was to foster the initiation of production in India, on a commercial scale, of lead, ferro-manganese, copper, steel, zinc, and other metals, which, as water-power is developed, will be produced in increasing quantities. In particular the Tata Iron and Steel Company, which began to produce pig-iron in 1911 and mild steel in the following year, was of great service during the war, and is now the largest metallurgical concern in the country. Other companies are at work, such as the Bengal Iron and Steel Company and the Indian Iron and Steel Company, and the production of iron and steel on a large scale is now fully assured. In one mineral—manganese—India now holds the leading place in the world, having displaced Russia as the greatest producer in 1907, and, after a decline, again in 1916; and in addition to gold, silver, and lead, the last of which is now a very large industry based mainly on the mines in the Northern

¹*Ancient India*, by J. W. McCrindle, p. 31.

Shan States, India produces zinc, copper, chromite, monazite, magnesite, tin, and platinum. Of some of these metals she imports more than she produces. This is the case with tin, her requirements of which are supplied from the neighbouring Federated Malay States, where much of the Indian ore is smelted, and which are responsible for at least 43 per cent. of the world's output.



Badge of Hong Kong. Arms of Ceylon. Badge of Seychelles.

CHAPTER XVI

GOLD—SILVER—PLATINUM

Gold.—On three occasions during modern times the course of events has been modified by the discovery of great quantities of gold and silver. When Columbus crossed the Atlantic and returned with specimens of gold wrung from the unwilling Caribs, the cupidity of the Old World was aroused, and the hope of finding precious metals in the new lands overseas drew Spaniards across the ocean to the unknown lands of Central and South America. A comparison of the prices that existed before the discovery of America and those that subsequently prevailed, shows how profoundly the economic life of Europe was disturbed by the mines of Mexico and Peru. This was the first occasion within historical times when the discovery of vast supplies of the precious metals changed the sluggish course of economic progress. The second occasion was in the middle of the last century, when the discoveries in California and Australia led to an immediate quickening of the economic pulse, brought about great changes in wages and prices, fostered the development and economic prosperity of new nations, and ushered in a new era in the establishment of industrial enterprises. Migrations on a great scale took place, and new communities sprang into existence where hitherto all had been in a state of pastoral simplicity. The third period is the one through which we are now passing, and commenced with the opening of the Transvaal goldfields, the discovery of the enormously rich deposits of Western Australia, and the later discoveries in the far north-west of Canada. In all these economic movements, with the exception of the first, the British Empire has played a great and commanding part, and much of the present distribution of wealth throughout the world is due to the efforts of wandering pioneers in distant parts of the empire, who, with pick and shovel,

have unlocked for the benefit of humanity new source of economic energy, and provided the motive power for many of the world's industries. With the more recent changes due to the overthrow of the economic standards of many countries, and the establishment of a fictitious and practically worthless paper currency these discoveries and developments have nothing to do. But to pass to specific rather than general results, it is evident that without the discovery of gold in New South Wales and Victoria, the progress of Australia would have been upon slow and leisurely lines, and Australia even now would be a purely pastoral and agricultural land with a population thinly scattered along its south-eastern littoral. In South Africa, the discovery of the Witwatersrand reefs so modified the destinies of the sub-continent that it is unnecessary to do more than allude to the remarkable changes that have been brought about. A new empire has been brought beneath the British flag; railways have been flung into the far interior, running their sinuous course over the veld in order to bring its wealth to the markets of Europe; cities have arisen in places that might still have been the abode of the lion and elephant; and rich districts have been opened for the peaceful operations of the agriculturist. The discovery of gold changed the placid life of the Boers and thrust them, willy-nilly, into the vortex of European politics and European economic life.

In Canada also, the progress of the Dominion towards greatness has been quickened by the discovery of gold. The finding of gold in British Columbia attracted thither a population that, as time went on, exerted an appreciable influence upon the policy of the Canadian ministry, led to the construction of the first Canadian transcontinental railway, to the development of the Pacific littoral, and the rapid expansion of the wheatfields of the Prairie Provinces. Gold, therefore, has proved the magic key of industrial life, and has created in no small measure the prosperity of vast areas within the British Empire that otherwise might have remained fallow and unpopulated.

With the historical aspect of the gold industry, it is impossible to deal in this book, and we shall therefore

describe briefly the present condition of the industry. Although gold is found in most portions of the Commonwealth of Australia, it is only in certain well-defined areas that it can be obtained in payable quantities. With the exception of South Australia, which produces less gold than any of the other states, there is not a state in which the industry does not contribute in a considerable proportion to the national wealth, and the total production of gold in 1909 was not far short of what it was soon after the first discovery, when the alluvial diggings were contributing their surface supplies to the miners. In 1853 its value was £12,611,000, and in 1909 it reached a total of £12,757,000, but has since shown a progressive diminution, until in 1920 it was valued at only £5,308,000, a decrease that has been general in all the States of the Commonwealth, but more particularly on the older workings in Victoria and New South Wales. The great gold-producing state is now Western Australia, where the output is some 64 per cent. of the total. At present, this state is divided into 15 gold districts: Kimberley, in the far north; the Pilbarra and West Pilbarra goldfields in the north-west; the Murchison, Peaks Hill, East Murchison, Mount Margaret, and Yalgoo fields, in the west-central districts; and the North Coolgardie, Coolgardie, East Coolgardie, and North-East Coolgardie, Yilgarn, Dundas, and Phillips River goldfields in the more southerly divisions. Each field contains many mines, and they cover an area of nearly 350,000 square miles, or over eight times the size of England. The greatest producing area is the East Coolgardie field, which accounts for two-thirds of the total output. This field lies in a practically desert country some 360 miles inland by rail from Perth, where the rainfall is less than 10 inches, and where camels are used as beasts of burden. Water is brought to these mines by a wonderful system of pipes from the hills near Perth. The second important area, Mount Margaret, lies to the north-east of Coolgardie, while the Murchison field, the third producer, is about 200 miles east of the port of Geraldton. The great mining towns of Kalgoorlie and Coolgardie are on the main Trans-Australian line, and the boom city of Coolgardie, built in the "wild and woolly" days when every man was a mine-owner

or a prospective millionaire, is now a typical example of the average mining city—generally unlovely enough, but often provided with substantial but frequently ugly buildings. Elsewhere in Australia the mining cities, such as Ballarat, Beechworth, and Bendigo, Bathurst and Gympie, although still mining towns, have become flourishing agricultural and pastoral centres, and contribute directly to the permanent prosperity of the Commonwealth. In Queensland, the celebrated Mount Morgan mines, near Rockhampton, which yielded over £12,000,000 worth of gold in twenty years, are the principal centre, with Charters Towers and Gympie far behind.

South Africa is the greatest gold-mining area in the world, and in the popular imagination the whole Union has been regarded as primarily a gold-producing country. As a matter of fact, however, the Cape Province only produced 2 ounces in the year 1921, Natal only 27 ounces, and the Orange Free State none, so that the industry is concentrated in the Transvaal, and mainly along the marvellously rich "Ridge of the White Waters" (Witwatersrand), which has proved the dominating factor in South African political and economic life. The beginnings of this great industry are to be found in far distant ages, before the Portuguese, Dutch, or British set foot in the land, and probably long before the present Kafir races had overrun the country. The theory that the ancient gold workings, scattered so plentifully over Southern Rhodesia, represent the Ophir of King Solomon, and that the remarkable ruins at Zimbabwe and elsewhere, are the fortified temples of the gold-workers, is supported by many evidences, both archæological and linguistic—but no definite proofs have yet been forthcoming as to the identity of the workers. Almost the whole of Mashonaland and Matabeleland is covered with these disused workings, and in the gold-bearing area of Rhodesia, a district roughly 700 by 600 miles in extent, these mines form "the most extensive gold-mines sunk to depth on rock during some prehistoric time yet known to the world." There are, in addition, "many scores of buildings of dressed stone blocks," and in all over five hundred ancient ruins have been discovered.

But the ancient gold-workers, whoever they were, did not discover the gold deposits of the Rand, and although the presence of gold there was known as early as 1854, it was not until, in 1884, Messrs. W. H. and Fred Struben had broached the riches of the conglomerate or banket beds that the vast riches of this region were realised. Previous efforts in mining in South Africa had been in other districts of the Transvaal—chiefly on the alluvial fields in the Lydenburg district—and mainly by private persons or small companies; but on the Rand the character of the deposits rendered the extraction of gold a difficult and very expensive operation, involving the employment of large capital and the subsequent creation of millionaires. The gold is chiefly contained in a series of quartz-pebble conglomerate beds, occupying a position near the base of the Witwatersrand formation, and as the particles of gold are extremely minute, the utmost perfection of machinery and method is necessary in order that the production of the gold should pay for the expenses entailed in its extraction.

The Witwatersrand goldfields are situated on an elevated plateau nearly six thousand feet above sea-level. The actual rand or ridge projects somewhat above the plateau, and apart from the difficulty of extracting the gold from the conglomerates, which has been overcome, two primary factors determine the utility and life of the mines. The first is the angle of dip. This depends upon geological considerations, which cannot be described here, and upon this angle the depth to which the mine can be worked is determined. At the outcrop, the angle is sometimes seventy degrees, or even more, but, speaking generally, although the reefs are steep at the outcrop, they become less steep as they proceed, though, not infrequently, as greater depths are reached, they again become steep, and the difficulty of reaching the gold is consequently increased. The second factor—and this depends upon the angle of dip—is temperature, for naturally when the dip is steep the depth becomes greater than it would be if the reef proceeded on an easy and gradual gradient. The limits of deep mining are governed by other causes in addition to temperature, and the depth at which profitable mining can be carried on is estimated at between 6000 and

10,000 feet, although Sir Lionel Phillips, when addressing the Chamber of Mines in 1909, estimated that at a depth of 7000 feet the temperature would be about 92 degrees Fahrenheit, and this is generally accepted as the limit of profitable mining. It is highly probable, however, that the last word has not yet been said in deep-level mining—a fact that opens up vast possibilities for mining on the Rand, and dispels some of the gloomy prophecies indulged in by pessimists who affect to see the early end of the Rand deposits in view; but in any case, as mines are at best a wasting asset, and their exhaustion cannot in many instances be accurately determined when reefs continue to a great depth, it is certain that there must always be a period to their existence. With regard to the Witwatersrand, various estimates have been made, and in 1914 the Government Mining Engineer, taking into account areas outside the then working mines, estimated that since 1886 some 20 per cent. of the original ore contents having been extracted, four times as much remained. On this basis, the life of the Rand cannot be for more than another three generations at the most.

Apart from the Witwatersrand, the chief mining centres in South Africa are the alluvial fields in the Lydenburg district, where some fair sized nuggets have been unearthed; the Klerksdorp and Potchefstroom goldfields, which, in reality, form a continuation of the Witwatersrand, and can be traced across the Vaal River for some distance into the Orange Free State; the Venterskroon district, about sixteen miles south-east of Potchefstroom; the De Kaap goldfields in the Barberton district (with the Swaziland field across the borders); the Waterberg and Low Country goldfields; the Tati Concessions goldfield in the Bechuanaland Protectorate; and the goldfields of Southern Rhodesia, in Matabeleland and Mashonaland, in which the chief mines are round Buluwayo, Gwelo, Gwando, Salisbury, and Victoria. The Rhodesian fields produce annually some £3,000,000 worth of gold, and, in addition to those in Southern Rhodesia, there are limited but high-grade deposits in Northern Rhodesia, although the present production is small.

With regard to Canada, where the output of gold is

worth some £3,200,000 per annum, the story of its finding and exploitation is unequalled in the annals of romance. Although placer mining was carried on intermittently in southern Quebec, it was not until between 1855 and 1857 that placer gold was found in British Columbia, which, until the discovery in the Yukon, was the principal contributor to gold production in the Dominion. Until recent years, the Klondyke region—an area larger than France—was an unknown and forbidding wilderness. In a country almost within the Arctic Circle, where in midsummer twenty-two out of the twenty-four hours are brightened by an almost tropical sun, and in mid-winter an equal proportion of the day is shrouded in darkness, with a temperature many degrees below zero, the conditions that attend gold-mining are entirely different from anything previously experienced. Although gold had been found in the far north and along the Yukon River for some years, it was not until 1896 that the Klondyke deposits were discovered, and at the beginning of 1897 thousands of would-be miners of both sexes were hurrying from the Pacific ports to the Klondyke. No route was more difficult to traverse, and the late-comers were caught in the icy embrace of the Arctic winter, and many were starved or frozen to death. The Yukon, with its mining capital of Dawson City, represents on Canadian soil the best example of Stefansson's recently enunciated theory of the "northward course of empire," and is only a concrete example of the enormous economic possibilities, and indeed, probabilities, of the vast unpeopled wilderness of northern Canada.

The total value of the gold produced in the Yukon Territory to the end of 1920 is estimated to be £36,120,000, but its present output is greatly exceeded by both Ontario and British Columbia, the former producing nearly 74 per cent. and the latter over 16 per cent. of the total output; the other producing provinces, Nova Scotia, Quebec, Manitoba, and Alberta, accounting for less than 1 per cent. between them. The production of gold in Ontario increased slowly up to the period immediately before the war, and has continued to increase, with fluctuations, ever since. The principal gold region is the Porcupine goldfield, the most important gold-mining area in Canada, situated on the Hudson Bay

slope of northern Ontario, about 100 miles to the north-west of Cobalt. Here the first important discovery of auriferous quartz was not made until 1909, and now gold to the value of £2,000,000 is extracted annually in this area of six square miles around the township of Tisdale. Unlike the mines of the Witwatersrand, which depend upon the neighbouring coal deposits for their power, the Porcupine mines derive their power from hydro-electric installations. Similarly, in the smaller Kirkland Lake mines and other gold properties in Ontario, water provides the motive force for the mines.

In New Zealand, gold-mining is an important industry, and it has had an effective result in bringing new-comers to the country. The discovery of gold at Gabriel's Gully, eighty miles from Dunedin, in 1861, and of several other rich fields, placed New Zealand among the leading gold-producers of the world. The most fascinating story is that connected with the celebrated Waihi lodes, where the tailings had been carefully stacked in the hope that some better system of extracting the gold might be discovered. This occurred in 1894, when the cyanide process was introduced, and the full riches obtained. To-day the mines situated in the Hauraki Peninsula and other parts of the Province of Auckland contribute more than half of the total production in New Zealand. The total of gold extracted during recent years has shown a progressive decrease due to the approaching exhaustion of the most accessible known alluvial deposits, the exhaustion of ore, and the increased cost of material and labour; and the output is now less than half of the record (£2,844,000) in 1866.

Three other portions of the empire have been noted for the production of gold from an early period—India, the Gold Coast, and British Guiana. From the earliest days, gold has been extracted from the auriferous deposits of Hindustan, and has been worked with rare skill by the native goldsmiths. At the present time, the bulk of the output is from the quartz veins of Kolar, in Mysore, but small quantities are obtained from the river sands in many parts of the country, and dredging is carried on in the upper reaches of the Irrawadi. The annual output has decreased during recent years, and it is now worth about £1,950,000. In the Gold Coast of West

Africa, gold has been sought from the times of Herodotus and much earlier. In a well-known passage in his works he tells us how the Carthaginians traded for gold along the littoral. In modern times the production of the metal did not become important until 1903, when railway communication was established between the port of Secondee and Obuasi, where are situated the mines of the Ashanti Goldfields Corporation, the most productive in West Africa. Here quartz veins are being worked, and also at Bibiani and Prestea. In the Tarkwa and Birrim districts, gold exists in conglomerate beds, and it is worked in alluvium in the Ancobra, Fura, Prali, and Offin rivers. The total amount of gold recovered annually in the colony is less than in the pre-war period, and is valued at about £1,250,000. In British Guiana, where the Elizabethans long sought the famed El Dorado, placer-mining is the principal method of extraction. The total annual production previous to the War was £282,000 (1913-14), but it has now sunk to £46,000 (1920). The decrease in output is not due to exhaustion of the gold, as gold exists in alluvial form of considerable thickness near the coasts, and, of course, in other forms in the inland regions. In addition to the countries already mentioned, small quantities of gold are produced in the Federated Malay States (chiefly Pahang), Papua, the Anglo-Egyptian Sudan (where gold has been worked for ages, and where there are round stone huts similar to those found in the west of the Transvaal), and Nigeria.

Silver.—The total production of silver within the British Empire averages about 40,000,000 ounces per annum, although the output during the last two or three years has been much less. The price of silver has fluctuated so considerably that it is not possible to arrive at any satisfactory estimate of the real value, but taking it at five shillings per fine ounce, the average annual output may be estimated to be worth about £10,000,000. Of this amount the largest quantity comes from Canada, followed closely by Australia. In addition to these two countries, the chief producing centres within the empire are India (chiefly Burma and Madras), the Transvaal, New Zealand, Rhodesia, and Great Britain.

Silver as a metal, although found pure, is generally obtained in conjunction with other metals, such as lead,

cobalt, copper, zinc, and gold. It is thus found, in conjunction with lead and zinc, at the celebrated Broken Hill mines situated in the desolate interior of Australia, in the west of the State of New South Wales, and in direct communication with the sea at Port Pirie in South Australia. The Barrier Range or Broken Hill mining field is about as unattractive a region as can be imagined, rivalling in this respect some of the gold areas of Western Australia, but it constitutes the richest centre of silver-lead-zinc production in the world, with an output up to the end of 1920 valued at over £106,000,000, and a capital of £7,637,000 sunk in the various enterprises connected with the mines. The chief producer is the Broken Hill Proprietary Company, which has paid away over £12,000,000 in dividends. The Barrier Range, where the mines are situated, was discovered by the explorer Sturt, but it was not until 1883 that the famous Broken Hill lode was found. The eleven producing companies which have drawn such enormous wealth from the soil of a desolate and unprepossessing region are the direct outcome of the accidental discovery of Charles Rasp, a boundary rider, who pegged out his claim and then formed a small syndicate to work the ore. The result of this enterprise has been the establishment of one of the biggest industries in Australia (for the Broken Hill Company has also worked the immense deposits of iron ore at the Iron Knob quarries in South Australia, and has established iron and steel works at Newcastle, in New South Wales), and the creation of a city of some 30,000 inhabitants in the parched and unlovely country around the mines. Elsewhere, in Australia, silver is mined at Zeehan, Mount Lyell, Margaret, and other mines in Tasmania; at Chillagoe, Herberton, Mount Morgan, and other places in Queensland; and at various centres in South and Western Australia.

In the Dominion of Canada, which produces silver to the value of about £4,000,000 annually, the metal is mined principally in Ontario and British Columbia, although deposits are also worked in Quebec and the Yukon Territory. The great mining field of Cobalt—one of the celebrated and outstanding mineral areas of the world—was discovered during the building of the Temiskamming and Northern Ontario railway, which

runs directly through the centre of its richest portion, and was primarily designed to open for purposes of settlement the "clay belt" of northern Ontario, and the location of the lodes was not determined until 1903. Since that date the progress of the mines has been remarkable, for, in addition to silver, the minerals found at Cobalt, in greater or lesser abundance, include cobalt, nickel, bismuth, iron, copper, graphite, zinc, and manganese. In British Columbia the silver deposits form a northern extension of the rich mineralised area of the Rocky Mountains, which passes through Nevada, Colorado, and Montana, the great silver regions of the United States. In the Canadian province, however, mining for silver has not hitherto attained large proportions, except in the Rossland district, where it is found in conjunction with gold and copper. The annual production of silver in the province is well over £500,000, the total output from 1852 to 1918 being valued at £9,000,000. In India, which has been termed the "sink" for silver, owing to the hoarding of the metal by the natives, and is the largest consumer in the world, only small quantities are produced in comparison with the great consumption, chiefly from the silver-lead mines of Bawdwin in Burma.

Platinum.—The platinum group of metals includes platinum, palladium, rhodium, osmium, and ruthenium. The first-named is of great industrial importance, and is used for many chemical and scientific purposes, in the production of jewellery, and in the preparation of dental plates. The output of platinum before the War was estimated at from 250,000 to 300,000 ounces per annum, about 95 per cent. of which came from Russia. The imports into the United Kingdom in 1920 were 2,752 ounces, valued at £64,033, compared with an import of 42,640 ounces, valued at £380,000 in 1913. Very little of the metal is at present produced in the empire, although deposits are known to exist, and in some cases are worked, in Australia, New Zealand, India, South Africa, Ontario, and British Columbia. The principal worked deposits in the Commonwealth are situated at Platina, near Parkes (New South Wales), where 796 ounces, valued at £16,672, were produced in 1920. In Victoria, it is found in conjunction with copper, and in Queensland it is associated with osmiridium. The

latter, or rather iridium, is largely obtained in Tasmania, and is alloyed with platinum. The yield has shown a considerable increase during recent years, over 2000 ounces, valued at £77,000, being extracted in 1920. The metal is of great intrinsic value, as much as £37 per ounce having been paid for it in 1918. In Canada, platinum is produced in small quantities from the nickel ores of the Sudbury district, and attempts have been made to extract it in British Columbia, while in South Africa traces of the metal have been found in several districts, more particularly in the Klerksdorp area of the Transvaal.

CHAPTER XVII

OTHER MINERALS

Aluminium.—This light metal is obtained chiefly from bauxite, deposits of which occur in Ireland, British Guiana, and India. The bauxite is mixed with cryolite, the only worked deposits of which are to be found in Greenland. Of the aluminium produced in the world, less than 8 per cent. is the product of the British Empire ; but as the demand is constantly increasing, particularly for uses where strength as well as lightness are requisite, it is highly desirable that new deposits of bauxite and cryolite should be discovered. In Canada, considerable quantities of aluminium are manufactured at Shawinigan Falls (water-power being desirable in its manufacture), near the mouth of the St. Maurice River, which enters the St. Lawrence at Three Rivers, from bauxite imported from the United States. The deposits of bauxite in British Guiana have been leased to the Northern Aluminium Company, which owns the works at Shawinigan. In India the conditions for the manufacture of aluminium are favourable, as large deposits of bauxite exist in the Central Provinces and in the hills of Chota Nagpur ; while aluminium minerals occur widely in New South Wales and Western Australia.

Antimony.—This metal, used chiefly as a hardening constituent of white metal alloys, comes chiefly from China, although small quantities are produced within the empire, chiefly in Australia. It is widely distributed within the Commonwealth, but the present production comes from Costerfield, in Victoria, and from the Hillgrove division of New South Wales. In Africa, it is produced in the Sebakwe district of Rhodesia, and it has also been worked in the Transvaal. Elsewhere, antimony has been worked in Newfoundland and Canada, but it also exists in the Southern Shan States of India, and elsewhere in Burma.

Asbestos.—The production of asbestos is now becoming a considerable industry in Canada and South Africa where extensive deposits exist. As its uses for industrial purposes, particularly for all fire-resisting materials, are constantly increasing, the production has also shown a considerable advance during recent years. Very little is produced outside the empire, which possesses what is almost a monopoly of the worked deposits. At the present time, the productive areas of eastern Canada yield the greater part of our supplies, and are situated in the Province of Quebec. Here the veins are disposed in all directions and without any systematic location, so that an estimate of the size of the deposits is almost impossible. During the ten years ending in 1919, however, over £10,000,000 worth of asbestos had been produced, the output having continuously increased to 158,000 tons per annum in 1918, the mines showing no appreciable diminution. The workmen are almost entirely French Canadians, but the output seems to be largely controlled and consumed in the United States, less than 6 per cent. finding its way direct to the United Kingdom, although small quantities come from the American ports. In the United States a large and important industry is dependent upon the supplies of Canadian asbestos—an industry that might well be transferred to British territory, both English and Canadian, seeing that while there are fourteen companies in Canada engaged in the production of crude asbestos, only two are engaged in manufacturing articles in which asbestos is employed. Outside Canada, the production of asbestos is increasing both in Rhodesia and the Union of South Africa. In the former country the output is now some 16,000 tons, while deposits are worked in the Eastern Transvaal, in the Cape Province, and in Natal, which have a total output of over 6000 tons. Deposits of asbestos also exist in Australia, New Zealand, India, and Cyprus. In the Commonwealth, numerous fields have been reported, but the principal productive district is in the Barraba division of New South Wales.

Barium.—The average quantity of barytes (barium sulphate) and witherite (barium carbonate) mined in the United Kingdom in the five years ending in 1913 was 45,000 tons, and the net imports averaged another

49,000 tons. In 1920, 31,000 tons of barytes, both ground and unground, were imported, chiefly from Germany, Spain, and Belgium. Practically none comes from within the British Empire, except that produced in Great Britain, and this is largely owing to the fact that it is of relatively low value and thus unable to bear heavy freights. It is mainly used in the preparation of paints, and in paper-making, textile, and oilcloth industries, and for enamelling. Deposits exist in various parts of the empire, but can scarcely be considered to be of value for other than local uses. It is worked in Nova Scotia and Northern Ontario, the local production being valued at about £27,000. In South Australia there are extensive deposits at Willunga, and it is produced in other parts of the Commonwealth, especially Tasmania.

Bismuth, Wolfram, Tungsten, Scheelite, and Molybdenum.—In 1889 the total world's production of bismuth was estimated to be less than 100 tons. In 1919 about 441 tons were produced outside the empire, mainly in Bolivia, and 163 tons in Australia. Wolfram, which is associated with bismuth and tungsten, is of very great use in hardening steel, and both tungsten and wolfram were greatly in demand during the war. The minerals vary greatly in composition, and merge into each other, and in practice the terms do not appear to be used uniformly. Wolfram and scheelite are also mined in Cornwall. The annual average output of the various tungsten ores in the chief producing countries (1909 to 1913) was about 5840 tons, of which Australia (in the form of wolfram and scheelite) contributed a little less than one-fifth. Prior to the war, Germany secured control of the best ores, her imports averaging 3690 tons, but the whole output within the empire was commandeered by the Government, and by 1920 the United Kingdom was importing 6763 tons of tungsten ores. The chief producing areas in the British Empire are Australia, India (chiefly Burma), British Malaya, Canada, and New Zealand. In Australia the chief centres of production are at Herberton and Chillagoe in Queensland, which have been reported as being in a position to supply the world's needs, at Torrington, on the New England plateau of New South Wales, and in Tasmania. In Burma, the mines are at Tavoy, on the

coast of Tenasserim, with numerous other deposits elsewhere. In Canada, tungsten ores exist near Falcon Lake, in Manitoba. Molybdenum, which, like tungsten, hardens steel, is found in an ore called molybdenite, and occurs in many districts. It was in great demand during the war, when the Dominion became the world's largest producer; but it is also produced in Australia, and occurs in many other countries. In New South Wales it is associated with bismuth, but the most promising deposits appear to be in the Mount Perry district in Queensland.

Borax.—Borax and boracic acid are of great value as food preservatives and antiseptics, but at present the empire is entirely dependent upon foreign countries for its supplies, which come chiefly from the United States and Chile.

Chromium.—Chromite is chiefly of value for making chrome steel, and the chief sources of supply within the empire are in Rhodesia, Transvaal, Canada, and India. A great deposit of Chromite exists in a hill composed almost entirely of the ore at Selukwe in Rhodesia, and also in a narrow belt extending from Selingwe to Umvukwe. At present Rhodesia supplies a large part of the world's output, exporting nearly 54,000 tons in 1920. In Canada the chief deposits are in the Province of Quebec, where about 10,000 tons are produced, and in Australia deposits are worked in various centres in New South Wales and in the Rockhampton district of Queensland. India is a considerable producer of chromite, chiefly in Baluchistan, Mysore, and Chota Nagpur. The Bhairapur deposits in Mysore were opened in 1918.

Cobalt.—The great deposits of cobalt ores, used as metallic cobalt for high-speed steels, for metal-plating, and as an oxide for pigments in the ceramic industries, which exist in Canada, have already been mentioned. Up to a few years ago, cobalt had not assumed any importance in the mechanical and metallurgical world, but its uses have been greatly expanded, and there is now a considerable demand for the cobalt contents of the ores. The Canadian refineries produce about 350 tons of cobalt a year, practically all being exported to the United States and England.

Copper.—The British Empire is not well provided with worked copper deposits, only about 100,000 tons being produced annually, chiefly in Canada, Australia, South Africa, and Rhodesia, out of a world's production of 1,000,000 tons. The Dominions Commission have estimated that of the total requirements of the United Kingdom (120,000 tons) only about 27 per cent. come from empire sources.

The chief sources of copper in Canada are in British Columbia and in the nickel-copper area of Sudbury, Ontario, the total output being valued at £2,800,000 in 1920. Great deposits exist in northern Manitoba, where in the Flin-Flon area, ninety miles north-west of Pas on the Saskatchewan River, it is estimated that there are over 16,000,000 tons of ore. It is unfortunate, perhaps, that production is largely controlled by American capital, which is stated to dominate 90 per cent. of the British Columbian output; but it is satisfactory to note that the ore is now being treated at Trail, near the boundary, where a refinery with a hydro-electric installation was established in 1916, and at several other works. A very considerable portion of British Columbia is rich in copper, both on the mainland and in the islands, and in the Atlin division there is an immense region, practically unprospected, from the Yukon boundary southwards. Here copper has been located and worked. The province produces nearly two-thirds of the Canadian output.

In Australia copper is found in all the States, but the principal productive areas are the Mount Lyell mine in Tasmania, the Cloncurry and Mount Morgan mines in Queensland, the Wallaroo and Moonta mines on York Peninsula in South Australia, and the Great Cobar mine in New South Wales; the value of the production in 1920 being £2,657,000. The Australian ores are refined at Port Kembla and Eskdale in New South Wales, at Wallaroo, in South Australia, and at Bowen in Queensland.

In South Africa the chief copper deposits are in the arid country of Namaqualand, behind Port Nolloth in the west of the Cape Province, and at Messina in the extreme north of the Transvaal, both large producers in normal times. Many other unworked deposits exist. It is estimated that in the Messina district there are

22,000 acres of copper-bearing ores, of which only some 600 acres have been worked, and the Dominions Commission have reported that "enormous fields of copper remain to be opened up." In the mandated territory of South-West Africa there are important deposits in the Otavi district, the principal mines being at Tsumeb, and in the Grootfontein district. Previous to the war, the Otavi mines were producing 54,000 tons of copper ore, and the Grootfontein area some 50,000 tons of copper and lead ores, but the output has not been so large since, 36,000 tons being produced in 1920. A great part of South-West Africa is highly mineralised, and numerous deposits of copper ores exist in other districts. Rhodesia also produces small quantities of copper, and many copper areas exist in the country, the principal mines being the Bwana M'kubwa in Northern Rhodesia. In Newfoundland, a highly mineralised but almost entirely unprospected country, there are considerable deposits of copper, but little is being worked at present, although considerable quantities have been exported in the past, chiefly to the United States. India is also a producer of copper to a small extent, but consumes an enormous quantity, valued at some £2,000,000 annually, and Papua and Cyprus possess large worked deposits.

Graphite or Plumbago.—Graphite is widely distributed in the British Empire, but the actual production is not large, though sufficient in normal times to supply the requirements of the United Kingdom. As a matter of fact, however, nearly half of the graphite imported into Great Britain comes from foreign sources, chiefly Madagascar and Japan. The chief producers within the empire are Ceylon and Canada, smaller quantities being mined in India, South Africa, and Australia. It occurs, however, in Kenya, Uganda, Rhodesia, and New Zealand—all potential sources of supply in addition to the unworked deposits elsewhere. Until recently, Ceylon was the largest producer of high-grade graphite in the world, and is noted for the purity of its product. The high costs of working, and the somewhat primitive methods employed, coupled with the severe competition of Madagascar and Japan, have resulted in a great diminution of the output, but it is reported that large deposits still exist. The value of the output has fallen

from £1,506,000 in 1916 to £51,000 in 1921. The only worked deposits in Canada are in the provinces of Ontario and Quebec, within a radius of 150 miles of Ottawa, but considerable graphite areas exist elsewhere, particularly in Baffin Island, where the graphite is stated to be equal to the best Ceylon product. In Kenya, graphite exists in the Machakos district, and is now being worked. One of the chief uses of graphite is for making lead pencils and for stove polishes, but the Ceylon graphite has been employed largely in the production of crucibles, for which purpose it is peculiarly suitable.

Iron.—Iron being one of the most widely diffused of the minerals, it is strange that the United Kingdom should import large quantities of ore from foreign countries and only small quantities from British possessions. The imports of iron ore, except chrome iron and pyrites, into Great Britain in the year 1920 were 6,507,000 tons, valued at £16,544,000, and of this amount less than 50,000 tons came from empire sources. By far the largest amount comes from Spain. The annual average production of pig-iron in the United Kingdom previous to the war was 9,616,000 tons, of which a little more than one half was from native ores. It is evident, therefore, that if freights can be adjusted so as to compete with the nearer supplies, and if the quality of the ore is equal, the overseas portions of the empire have a great market for their iron ores. This question, however, can only be decided by those engaged in the industry, and it is sufficient here to indicate the immense resources of the empire in iron-ores, and the uses that are being made of them. The principal ores of present commercial value are magnetic iron-ore, or black oxide of iron; hæmatite, consisting of two kinds, red and brown, the latter known as limonite; siderite, or carbonate of iron, a low-grade iron-ore; and the allied ankerite.

Although Canada contains immense deposits of iron-ores, the majority of those at present known require special treatment to raise them to the standard of furnace requirements. For this reason, the Dominion does not manufacture large quantities of her native ores, but, having large blast furnaces, imports ore very largely from the United States and Newfoundland. The actual mining of the ore is at present largely confined to northern

Ontario, the quantity of native ore produced being only sufficient to supply about 5 per cent. of Canadian requirements, although considerable progress is likely to be made in British Columbia and elsewhere in the near future. Magnetite is the most widespread of the irons, but hæmatite has been reported, and worked, in various districts. Blast furnaces are in operation at different points, including Sydney, Hainilton, Port Colborne, Sault Ste. Marie, and Midland, and electric furnaces are also in operation in British Columbia and elsewhere. In particular, it is believed that an extensive iron and steel industry might be established in British Columbia, and great developments in steel production have taken place during the past few years, the Nova Scotia Steel and Coal Company and the Dominion Iron and Steel Company having been merged into one concern, known as the British Empire Steel Corporation, which controls the largest single deposit of iron-ore in the world, and works the blast furnaces at Sydney, Nova Scotia. The Algoma Steel Corporation (Ontario) have also started a mill for the manufacture of structural steel. The great iron-ore resources of Bell Island, which is situated in Conception Bay, Newfoundland, are known as the Wabana Mines. They belong to the British Empire Steel Corporation, and up to the end of 1919 the total shipments of ore had been 16,758,000 tons, the greater part being sent to Sydney on Cape Breton Island, 415 miles distant, for treatment. It is stated that these deposits of hæmatite are practically inexhaustible, and could supply the entire world's demands for more than twenty years, and that at the present rate of output the mines would last another 3600 years—a pleasant prospect for their owners.

Prior to the war, practically all the iron and steel requirements of Australia were met by imports from Europe and America, in spite of the fact that there are large deposits of iron-ore in the Commonwealth. The imports of iron and steel manufactures annually amounted to about £8,000,000, but in 1915, with the establishment of the Broken Hill Proprietary Company's works at Newcastle, a new period of development was entered upon, and the policy of the Commonwealth Government to have all metallic ores, so far as possible, treated within

Australia, is likely to prove of very great benefit to the country. Any estimates of the amount of iron-ore available must be inconclusive. But there is an actual iron-ore reserve of nearly 345,000,000 tons, with another probable reserve of 503,000,000 tons. Of the possible reserves, it is, of course, impossible to speak; but it may be stated confidently that much more is known about the iron resources of Australia than is the case with Canada, although it is quite possible that further enormous deposits may be discovered. The greatest deposits of iron-ores are undoubtedly in Western Australia, by far the largest of the Australian States, with a vast mineralised hinterland, much of which is only at present imperfectly known. The whole of this great area, however, is undeveloped so far as its iron resources are concerned, and the greatest development has taken place in South Australia, which accounts for nearly 70 per cent. of the iron-ore produced in the Commonwealth, New South Wales, and Queensland. In addition to the great iron and steel works at Newcastle, which receive their iron mainly from the Iron Knob and Iron Monarch, and Hummochy Hill, the two former about 41 miles from Port Augusta, in South Australia, and the latter on the western shore of Spencer Gulf, not far distant, there are the works at Lithgow, where the New South Wales ores are treated. The iron-ore deposits of Western Australia are at present undeveloped owing to the absence of suitable coal; but enormous deposits of hæmatite have been found on Koolan and Cockatoo Islands in the land-locked harbour of Yampi Sound, about 100 miles north of the small port of Derby, and it is suggested that the ore should be shipped to Bowen, on the coast of Queensland, where there is coal, to be blended with ore from Cloncurry, in the west of Queensland, where there is another mass of hæmatite, and coal carried back as cargo to Yampi Sound, which might become an important coaling station. The Queensland Government have already established State Iron and Steel Works at Bowen. The geographical situation of Australia with reference to the Pacific and Indian countries, with their teeming population, opens up vast possibilities for an iron and steel industry whenever economic conditions can be adjusted satisfactorily.

In New Zealand, nothing definite has been done towards a development of an iron and steel industry, with the exception that the government have provided bounties to be given for the production of pig-iron and steel, and that the commercial exploitation of the iron-sand deposits at New Plymouth has been commenced. Such deposits occur at many points along the west coast of the North Island. Parapara, at the north-west corner of the South Island, appears to be the only area of iron-ore of present economic importance, although other minor deposits are known and may be worked in the future.

With regard to South Africa, it is generally conceded that the iron-ores are not generally of a nature to command a high price in overseas smelting centres, and the distance of the deposits from the coast is also a factor likely to affect production. But the Union contains vast supplies of iron-ore, and blast furnaces are in operation, and a local industry might be established successfully. In particular, it is believed that Pretoria and the surrounding country will become a considerable iron and steel centre, as there are great supplies of ore in the neighbourhood. Vereeniging and Newcastle have also entered the manufacturing stage, and in 1919 the value of iron and steel produced in the Union was £405,000.¹ By the Iron and Steel Encouragement Act, 1922, bounties are to be paid on pig-iron and steel produced in the Union. In view of the great consumption of iron and steel in South Africa, and the proximity of tropical countries in course of development, it is probable that there may be a great increase in this industry in the near future. In the neighbouring territory of Rhodesia, in addition to the chromite deposits previously mentioned, no estimate is possible of the iron-ore resources. In 1910 Mr. E. P. Mennell reported that "any estimates of the iron-ore resources of the world must take into account the enormous development of iron-bearing rocks in Rhodesia and other parts of tropical Africa," and the position has not substantially altered since that date. Mr. Mennell then stated that these deposits were "probably unequaled in any part of the world that has been exploited up to the present time." In tropical Africa,

¹ Iron-ores: Part 2, British Africa. (Imperial Mineral Resources Bureau), 1922.

there are many valuable known deposits, such as those near the junction of the Niger and Benue Rivers, and those in Kordofan, Kenya, and Tanganyika, but economic difficulties are likely to prove insuperable barriers in the way of active exploitation for many years to come.

Of British territories in Asia it is hardly necessary to speak in detail. India possesses sufficiently high-grade ores to supply an iron and steel industry of the first magnitude, and great developments are taking place. The Tata Iron and Steel Company, mentioned on p. 235, is the only steel producing concern at the present day. The company owns valuable iron-ore concessions in Orissa and in the Raipur district of the Central Provinces, manganese deposits in the Balaghat District of the Central Provinces, magnesite and chromite in Mysore, and coal in the Jherria field. Its works are at Jamshedpur, formerly known as Sakchi, and are due to the initiative and organising ability of the late Mr. J. N. Tata, and the enormous development during the war is illustrated by the fact that the paid-up capital of the company, £7,014,000, is being increased by another £12,000,000, which is the cost of the great extensions that are being undertaken. The manufacture of steel upon a large scale in India is, of course, a great advance in Indian industrial life, and during 1919 the output (for ten months only) was 233,000 tons of pig-iron and 134,000 tons of steel. This is not the total capacity of the works, which is 200,000 tons of steel, while provision has been made for an output of 425,000 tons of steel in the near future. The importance of this company during the war was expressed by Lord Chelmsford, the Viceroy, who stated that he could hardly imagine "what we should have done if the Tata Company had not been able to give us steel rails, which have provided not only for Mesopotamia, but for Egypt, Palestine, and East Africa." India has a very large market for iron and steel products, the value of imports in 1913-14 being over £17,000,000, but now that she has entered the manufacturing sphere on her own account a new economic feature has been introduced, which as directly contributes to the prosperity of the country as it must eventually affect the iron and steel exports of Great Britain.

Lead.—The smelter production of lead within the

British Empire averaged 148,000 tons during the years 1918-1920, and represents only a small proportion of the world's production. It is estimated that the annual consumption in the United Kingdom is about 180,000 tons of pig-lead, and the imports are almost equally divided between British and foreign countries, Spain and Australia competing for the British market. Of other importers into Great Britain, Rhodesia and British India are increasing their supplies. By far the largest part of the Australian output is derived from the Broken Hill mines. The lead-ores and concentrates are sent to Port Pirie at the northern end of Spencer Gulf, South Australia, where are the largest lead works in the world, capable, when working to their full extent, of producing 200,000 tons of pig-lead and 12,000,000 ounces of silver per annum. A small portion of the ore is sent to Cockle Creek, near Newcastle, New South Wales. Other lead mines are worked at Zeehan, Tasmania, and both Queensland and Western Australia have important deposits, those in the former State being in the Burktown district and those in the latter lying north of Geraldton in the Northampton mineral field. In Canada, there are lead mines in British Columbia, particularly in the West and East Kootenay regions, around Fort Steele in the former district, and Slocan and Ainsworth in the latter. The ore is chiefly treated at Trail. The production of lead in India has shown a marked increase since the beginning of the war, and India is now self-supporting as regards the metal, and in a position to export considerable quantities. The lead is chiefly mined in Burma, at Bawdwin and Tawnpeng. In Rhodesia, lead comes from Broken Hill, about 350 miles north of the Victoria Falls, where mining operations were commenced in 1914. The production has steadily increased, and the greater part of the output is sent to the United Kingdom.

Manganese.—For a long period before the war the chief producer of manganese ore was Russia, but India has now assumed the leading position in the world's output, largely owing to the disturbed condition in the Caucasus, hitherto the chief source of supply. The uses of manganese are so many and varied that it is regarded as one of the most important ores. As an alloy and for many chemical purposes it is in great demand. It is

fortunate, therefore, that the British Empire is well supplied with the mineral, for in addition to India, promising deposits are being worked in the Gold Coast, Australia, and Canada. The exploitation of the Indian manganese ores did not commence until 1892. The deposits are widely distributed, but the main supplies come from the Central Provinces, particularly Balaghat, Bhandara, Nagpur, and Jubbulpore, and from Shimoga in Mysore. In the Gold Coast large deposits are being worked near Tarquah, where work was commenced in 1916, and it is stated that 90,000 tons could easily be produced annually. In Australia, production is at present small, although considerable deposits exist, and in Canada very little has been mined, and the ferromanganese is imported from Great Britain and the United States. Hitherto no large deposits have been located.

Mica.—The United States, India, and Canada, in the order named, are the chief producers of mica, the industrial uses of which were largely extended during the war. It is principally used as an insulating material in electrical appliances, and for lamp chimneys and similar purposes. In India, the mica is generally of the muscovite variety, colourless and transparent. In Canada, it is usually of the phlogopite kind, and is generally of a brown colour, and is consequently known as amber mica. The exports from India average about 3000 tons per annum, and those from Canada about 500 tons, although the actual production is much greater. Deposits of mica also exist in the Macdonnell Ranges of Central Australia—a region of very extensive mineral possibilities, but too distant from the centres of industry to bear the necessary transport charges—in the neighbourhood of Cloncurry, Queensland, and near Coolgardie. In Africa, deposits have been located on the slopes of Mount Kenya, in various districts in Rhodesia, in the Leydsdorp area of the Transvaal, and in the Tanganyika Territory. In the last country, the deposits, north of Morogoro, were worked by the Germans, and subsequently by the British authorities.

Nickel.—Canada now furnishes the bulk of the world's supply of this metal, which comes chiefly from the nickel-copper ore deposits of the Sudbury district of Ontario,

although some is mined in the Cobalt area. Some of the ore is refined in Canada, but the greater part is shipped to refineries in the United States and Wales, where they are dealt with in this country by the Mond Nickel Company and the Anglo-French Company, whose refineries are near Swansea. It is certain, however, that much larger quantities will be refined in Canada, as the International Nickel Company has a large refinery at Port Colborne, Ontario, and the British-American Nickel Corporation has a nickel-refining plant at Deschenes, on the Ottawa River. There are other occurrences of nickel in Ontario, and nickel ores have been located in Australia in the States of Queensland, New South Wales, and Tasmania. They also occur in various districts in South Africa.

Nitrates and Phosphates.—Hitherto no deposits of nitrate of soda have been located within the British Empire, although nitrate of soda is obtained from Egypt, and the chief, and practically the only supplies, are the vast nitrate fields of Northern Chile. The absence of this important fertiliser, which is also of enormous importance in the manufacture of explosives, is a serious problem in many countries. In the case of the United Kingdom, some 140,000 tons are imported annually, but during the war this quantity was greatly exceeded, some 526,000 tons, valued at over £15,000,000, coming from Chile in the year 1918. Synthetic nitrates are being produced on a large scale in Norway by fixing the nitrogen from the air, and it was to this supply that Germany turned during the war. Of potassium nitrate (the true saltpetre or nitre), India is the chief source of supply. The manufacture is carried on chiefly in the Gangetic plain, in the three provinces of Bihar, Agra and Oude, and the Punjab, and is controlled by licence. The crude saltpetre is extracted from nitrous earths, scraped during the dry season from roads, walls, etc., in and around villages, and could only be obtained in this way from a country of enormous population.

The importance of phosphates to the agricultural industry has led to an increasing demand for this product especially in the United Kingdom, Australia, and New Zealand, and it is probable that in the not distant future Canada also will require large quantities of this product.

The world's production of phosphate rock was estimated at nearly 7,000,000 tons before the war, the United Kingdom importing about 500,000 tons. In 1920, 523,000 tons, valued at £2,655,000, were imported, exclusively from foreign sources. The British Empire possesses potential resources of phosphate rock of considerable magnitude, and also certain deposits that are being worked ; but their output is not more than sufficient to supply the needs of Australia and New Zealand. The former imported 237,000 tons in 1920-21, valued at £721,000. The principal worked deposits are those of Christmas Island, in the Indian Ocean, about 190 miles south of Java, whence about 50,000 tons are exported annually ; Nauru Island, which is situated in the Pacific just south of the Equator, and is a mandated territory under the joint control of the United Kingdom, Australia, and New Zealand ; and Ocean Island, one of the Gilbert and Ellice Islands group. From Nauru, about 90,000 tons, and from Ocean Island about 118,000 tons are exported annually. Extensive phosphate deposits also occur at Saldanha Bay, Cape Province, and in certain other districts of South Africa, and there are a few small deposits in Canada, especially at Buckingham in Quebec.

Sulphur.—The United Kingdom and all the Dominions import large quantities of crude sulphur, of which practically none is obtained from within the empire. Sulphur and sulphuric acid are obtained, however, largely from iron pyrites, 630,000 tons of which were imported in 1920, exclusively from foreign countries, principally Spain. It is evident, therefore, that the British Empire is at present entirely dependent upon foreign supplies for its sulphur and sulphuric acid. Small deposits exist in New Zealand, at the Bay of Plenty, and Rotorua.

Tin.—The British Empire is extremely rich in tin, and the extraction of this metal and its export is one of the oldest, if not the oldest, industries of England. For many hundreds of years, and perhaps for thousands, the tin mines of Cornwall supplied the Continental nations with this metal. In Roman times, tin was mined in Cornwall, and, according to Diodorus Siculus (first century B.C.), carried to a "certain island adjoining Britain called Iktis," whence it was exported to Gaul.

This island has been identified variously as Mount St. Michael and the Isle of Wight. Exponents of the latter theory state that the tin was conveyed in carts at low tide across the western end of the Solent, carried across the island to Niton, near Ventnor, and thence sent to Gaul. It is probable, however, that the Phoenicians traded here long before the Romans, and recent discoveries suggest that the Minoans, whose civilisation preceded that of Greece by many centuries, obtained tin from Cornwall and carried it to Crete.¹ At the present time, however, the mines of Cornwall do not produce tin in sufficient quantities for our needs (about 14 per cent. of the home consumption is produced in Cornwall), and recourse is had to the overseas portions of the empire.

The chief source of our tin supplies is British Malaya, which, in addition to being the largest producer in the world—the Federated Malay States alone accounting for some 35 per cent. of the world's output—is also a great exporter of tin imported for treatment and exported, after being treated in the tin-smelting and refining works at Singapore and Penang. Tin is found throughout the peninsula, in the Straits Settlements (Malacca especially), in the four federated states of Perak, Selangor, Negri Sembilan, and Pahang, and in the unfederated states of Johore, Trengganu, Kedah, and Perlis—Kelantan alone being a non-producer. The predominance of British Malaya as a producing country is mainly due to the rich and easily worked deposits of the Kinta Valley in Perak. Here every known method of alluvial mining seems to be employed, from the most primitive to the most elaborate, and many of the mines are under Chinese management. The total export of tin was 34,934 tons in 1920. It has decreased considerably during the past few years, partly owing to economic causes, and partly to the approaching exhaustion of certain alluvial fields, but it is believed that when the vein deposits are fully worked there will be an increase in the output.

Apart from Malaya, Nigeria and Australia are the only other important producers of tin in the British Empire. Very rich deposits exist in West Africa, over about

¹*Dawn of Civilisation*, by Angelo Mosso.

9,000 square miles in Northern Nigeria, chiefly in the Bauchi district, and a railway has been specially constructed from Zaria, on the main Lagos-Kano line, to Bukuru, a most important centre of tin-mining. The output is 5539 tons (1920), and is about four per cent. of the world's total. Australia runs Nigeria very close in the production of tin. Most of the tin is sent to Singapore to be dealt with, although attempts are being made to develop a tin-smelting industry in the Commonwealth. Tin is mined in all the Australian States with the exception of South Australia, even the Northern Territory, that Cinderella of the Commonwealth, contributing its share. It is chiefly obtained in New South Wales and Tasmania, the output from Queensland having steadily fallen during recent years. In Tasmania, tin has been mined for many years, the output between the years 1880 and 1919 being valued at £13,631,000. The most important fields are in the north-west and north-east of the island, particularly at Zeehan. In South Africa, tin is mined in the north-west portion of the Transvaal, and it has also been mined in the South-West Africa Protectorate, about 150 miles north-east of Swakopmund. Alluvial tin is worked in the native territory of Swaziland, where the production appears to be increasing. Tin is also mined in India in the Province of Burma, and the concentrates are exported to Singapore for treatment, as is also the case with Swaziland.

Zinc.—The greatest producers of zinc are the United States, Germany, and Belgium. The position with regard to Germany at the outbreak of war is explained elsewhere. The production of spelter in the United Kingdom has shown a steady decline since 1913, while that in the United States has shown a corresponding increase. The production in Europe was controlled by a combine previous to the war, largely dominated by German and Belgian interests. Within the empire, the Australian deposits at Broken Hill form the most important source of supply, and practically the whole of the zinc concentrates, about 500,000 tons annually, went to Germany. Important developments took place in Australia after the war broke out, and a co-operative body, known as the Zinc Producers Association, was formed in order to deal with the marketing of the Australian product.

The members of this body were pledged to sell the whole of their output through the medium of the Association, and the Imperial Government agreed to purchase a minimum of 250,000 tons of Australian concentrates over a period of ten years, and 45,000 tons of Australian spelter per annum. The exports from Australia, however, have not reached the figures of the pre-war production, only 24,000 tons of ores and concentrates (zinc contents) being exported in 1920, against 228,159 tons in 1913. The position, therefore, is still highly unsatisfactory, and the Australian zinc industry has suffered a severe setback, which is partly accounted for by the increased production in the United States. Recent developments, however, suggest an increased production of spelter within the empire. Arrangements have been completed for a British controlling interest in the Swansea Vale works, the great Avonmouth works, and the Electrolytic Zinc Company's works at Risdon, Tasmania, which together are capable of furnishing half the British requirements in spelter. The senior controlling body will be the National Smelting Company, with Sir Robert Horne as chairman. Zinc ores exist in various other portions of Australia and in other parts of the empire, particularly at the Bawdwin mines in Burma, whence the ore has been exported to Japan. In Canada, the zinc-mining industry is concentrated in British Columbia and Quebec, especially in the Kootenay district of the former province. During the war, zinc-reduction works were established, and Canada is now producing a considerable and increasing amount of zinc.

CHAPTER XVIII

COAL AND OIL

Coal.—The success of the mineral industries depends so largely upon the presence of coal, that some attention must be devoted to the coal resources of the empire. It is not necessary here to do more than allude to the great coal resources of the United Kingdom, and to the prosperity of this country as a manufacturing centre owing to the excellent quality of its coal. Of the coal-producing countries of the world, the principal is the United States, which furnishes and exports much more than the United Kingdom. Germany runs Great Britain very close as a producing country, and before the war imported and exported large quantities of coal. In the case of Great Britain, while the output has been fairly uniform during the last few years (229,000,000 tons in 1920), the exports have shown a continuous diminution, decreasing from 73,000,000 tons in 1913 to only 25,000,000 tons in 1920 (although they increased to 64,000,000 tons in 1922)—a condition mainly due to the disturbed industrial state of the chief importing countries. The time is in sight, of course, when the coal resources of the United Kingdom will prove inadequate to the demands made upon them, and the Royal Commission on Coal Supplies reported that “we look forward to a time, not far distant, when the rate of increase of output will be slower, to be followed by a period of stationary output, and then a gradual decline.”

It is satisfactory to know, however, that the overseas portions of the empire possess great resources in coal, particularly Canada, South Africa, and Australia. The resources of Canada have already been alluded to on p. 230, but it may here be said that the Dominion produces nearly 15,000,000 tons in a year, and that the output is steadily increasing. The great Canadian coal-fields are widely distributed throughout the Dominion.

In Nova Scotia there are four large fields—Sydney, Inverness, Picton, and Cumberland. The first two are situated on Cape Breton Island, and being the nearest important mines to Great Britain may be regarded as a possible source of supply in the future. The Sydney coalfield is situated in the north-east corner of the island, with the magnificent deep-water harbour of Sydney as its central feature, and in addition to supplying the iron and steel works at Sydney, sends coal to the other Canadian provinces, to the eastern coasts of the United States, and to the West Indies. The Cape Breton deposits extend beneath the sea, and it is estimated that, taking the three-miles' limit as a basis, there are over four thousand million tons in reserve, with another one thousand million tons in the land area. The other deposits in Nova Scotia extend along the northern coast or in its neighbourhood. The coal area continues into the neighbouring province of New Brunswick, where Minto, on the Green Lake field, is the chief centre. A further large unworked area lies to the north of Minto. Ontario, the greatest industrial province of Canada, is lacking in coal resources, but there are large areas of low-grade lignites in the Moose River basin. In the Prairie Provinces there are great tracts of land underlain by coal deposits of various kinds, but the chief worked fields are in Alberta, where the output is increasing rapidly. It is now equal to that of Nova Scotia, and is likely to exceed it in the future owing to the proximity of Saskatchewan and Manitoba with their comparatively poor supplies and the nearness of the United States. The principal worked fields are in the neighbourhood of Edmonton, Lethbridge, and Calgary, with another large area known as the Crowsnest Pass or Blairmore-Frank field; but large unworked deposits exist near Medicine Hat, and coal-bearing formations extend throughout the province from the borders of the United States to the Peace River. The actual coal reserves of Alberta alone have been estimated to be some 386 thousand million tons, with a further possible reserve, based on known areas, of 673 thousand million tons. In the adjoining Province of British Columbia, across the Rocky Mountains, there are also immense deposits of coal, estimated at over 73 thousand million tons,

including anthracitic, bituminous, and lignitic coals, by far the greater part being bituminous. The principal worked fields are in the south, such as the Crowsnest Pass (also extending into Alberta)—the largest producer in Western Canada—the Nicola River field, the fields in Vancouver Island, and the Queen Charlotte Islands deposits. Enormous areas of coal, however, are known to exist in the northern interior on both sides of the railway to Prince Rupert, extending in all probability into regions that have not as yet been fully prospected. Farther north in the Yukon Territory there are known to be great coal measures, three large areas having been located along the Yukon River, one of which is not far from Dawson City. There is also one worked field in the Tantalus coal area, on the Lewes River, north of Whitehorse. It is probable that this area will become one of the most important mining centres in the world, owing to the presence of gold, copper, and many other minerals.

The great coal areas of Australia are mainly concentrated in New South Wales, with lesser areas in Victoria, Queensland, Western Australia, and Tasmania. In New South Wales the mines are situated along the Hunter River at Maitland and Newcastle; at Lithgow, about 95 miles from Sydney; and at Ilawarra, about 15 miles south of Newcastle. The coal measures extend from a point above Newcastle in the north to Mount Kembla in the south, a distance of about 120 miles, and inlands in a north-westerly direction, covering an estimated area of 16,550 miles. Within this region are situated Sydney, Newcastle, Maitland, Wollongong, and other important towns, and in it, or around it, are deposits of iron ores, especially near Lithgow and Newcastle. This area is, and will remain, the great industrial region of the Commonwealth, the actual reserve of coal being estimated at over 118 thousand million tons. It will thus, in the future, have a great advantage over the Melbourne area with its more distant and much smaller coal deposits. The production of coal in Victoria is not much more than one-tenth of that of the New South Wales fields, and comes mainly from the State mines at Wonthaggi and Morwell, both in the southern Gippsland area. Queensland possesses considerable coal resources,

the principal fields extending southwards, not far from the coast, from a point west of Cooktown to the neighbourhood of Brisbane, near which city, at Ipswich, are the largest producing mines. The next most important area is the Clermont field, inlands about 250 miles west of Rockhampton. The Chillagoe (Mount Mulligan) field, 120 miles west of Cairns, is the most northerly worked area. In Western Australia the only productive area is the Collie field, in the south-west, where six collieries are at work; but other deposits are known to exist, though not near to the principal iron-ore deposits so far as has been determined. Tasmania has numerous coal seams in the north and north-west of the island, the principal worked area lying between Fingal and St. Mary. The present production of coal in Australia is from ten to twelve million tons annually, of which about one-tenth is exported, and assuming the reserves to be 165 thousand million tons, the supply at the present output would last 13,750 years—a sufficiently long period even for the most pessimistic.

Although coal occurs in several districts in South Africa, the chief workable deposits lie within a well-defined region extending in the south from the highlands of Natal in the neighbourhood of Estcourt, to Middleburg in the Transvaal, and in the east from the Zululand coast to Kroonstad and a little beyond, with a belt of coal measures running northwardly from Zululand, through Swaziland and the eastern portion of the Barberton, Lydenburg, and Pietersburg districts of the Transvaal into the Zoutpansberg district bordering upon Rhodesia. The chief deposits lie on both sides of the Witwatersrand, roughly correspond with and overlies in certain cases the gold areas, and mingle with, or are near to, important deposits of iron ore. It is easy to see, therefore, that the south-east Transvaal and the north-west of Natal form an area of exceptional mineral riches, where there has already been developed a great gold-mining industry, and an important and increasing coal industry, but which, in addition, will be of importance in the future for its output of iron and steel. These coalfields are an essential feature of the economic development of South Africa, for not only do they supply the mines and railways of the Union, but, owing to their proximity to the coasts and

the general cheapness of the coal, an important export trade, from Lourenço Marques and Durban, has already been developed. The Dominion Commission reported that "the cheapness of supplies and the growing amount of South African coal used for export and bunkering purposes should exercise a considerable influence over Imperial ocean communication."

In addition to the areas mentioned above, other fields exist to the north of Pretoria and in the east of the Cape Province (known as the Molteno fields), but the great bulk of the coal produced in the Union comes from the Transvaal and Natal, the total output being about 10,000,000 tons per annum. The principal mining districts are Witbank in the Transvaal, and Dundee and Newcastle in Natal. It is estimated that the probable reserves of the known coals of South Africa are some 56 thousand million tons. In addition to these deposits, a large coal area exists around Wankie in Southern Rhodesia, already an important centre of production, and other important coal deposits have been located in the Luano district, close to the eastern Portuguese border. Coal is also present in Nyasaland. Elsewhere in British Africa the only important deposits are in Nigeria, where very important and extensive areas are being developed in the Udi coalfields, which have been connected by rail with the sea at Port Harcourt, and will eventually be joined with the Lagos-Kano railway. These mines have only recently been developed, and they proved of great value during the war, when Welsh coal was practically unobtainable. The deposits cover an area of 1800 square miles.

Since the year 1913, the production of coal in India has increased very largely, from 16,000,000 tons to 22,628,000 tons in 1919. This has been due largely to the disappearance of Welsh coal from the Indian market. The coalfields are widely distributed throughout the peninsula, but the two principal fields, the Raniganj and Jherria, supply between them about 83 per cent. of the total output. The former lies chiefly in the Burdwan district of Bengal, and the latter is in the adjoining province of Bihar. There are, however, many other important fields, particularly near Yellandlapad in Hyderabad, in Rewah (Central India), in Baluchistan,

and Assam. In other parts of the East, coal is being worked along the coasts of Borneo, in British North Borneo, Brunei, and Labuan; the fields in the first territory being of considerable extent. In British Malaya, too, comparatively small deposits are being worked in Selangor.

Petroleum.—It is unfortunate that petroleum, which has become a vital necessity in the life of every nation, and the uses of which are increasing every year, is very poorly represented in the British Empire. So important is petroleum, both from the economic and political points of view, that the Dominions Commission suggested that "where in any part of the Empire an extensive oil-bearing area is found, steps might be taken to reserve some portions from public competition, so that, where circumstances permit, special provisions may be made for their development and the employment of the product for naval purposes. This course, we understand, has been already adopted by the Governments of the United States and Russia, and the example would seem well worth copying in the British Empire."

With the history of the control of the world's oil-fields we cannot deal in this volume. It is sufficient to state that a keen and prolonged political and economic fight has proceeded, and is still proceeding, for their control; that the vast resources of capital have been engaged in the struggle; and that the inner political history of certain regions of the world might well be summed up in the one word, Oil. It is evident that British interests in Persia and German interests in the construction of the Bagdad Railway, and its extension to the head of the Persian Gulf, were largely influenced by the fact that in that region there exist enormous petroliferous areas, the control of which seemed vital to the policies of both countries. The despatch of the Admiralty Oil Commission in 1913 was of great interest to the Germans, for not only was it reported that the areas around the Karun River were of exceptional richness, but also that oil was to be found in many portions of the Persian Gulf littoral, at Koweit, Burgan, the Bahrein Islands, Daliki, Lingeh, Kishm, and Sirim.¹ Hence interest in the operations of the Anglo-Persian Oil Company became

¹Evans Lewin. *The German Road to the East*, p. 72. 1916.

redoubled, and every effort was made to oust the British from their political and economic position in the Persian Gulf.

The enormous increase in the use of petroleum may best be illustrated by a comparison of the world's production in 1913 and 1920. In the former year the total output was estimated at 55,087,000 tons, and in 1920 at 98,236,000 tons, in spite of the greatly decreased output in Russia, Galicia, and Rumania. "One of the features of the recent war," states the Imperial Institute monograph on Petroleum, "was an extraordinary development of the uses of petroleum in munition factories, motor transport services, aviation, tanks, and warships of all classes; every phase, in fact, of both naval and military operations led to demands for petroleum products in ever-increasing quantities. With the renewal of peace activities, these requirements seem likely to be maintained and possibly augmented, since the adoption of fuel oil on a large scale by the mercantile marine may well be regarded as certain." It is evident that the demand has largely increased since, for, considering the United Kingdom alone, the imports of petroleum and its products have been as follows:—

		1913 Gallons	1920 Gallons
Crude petroleum,	.. ..	1,108,000	4,180,000
Lamp oil,	.. ..	157,141,000	160,951,000
Motor spirit,	.. ..	100,858,000	206,910,000
Spirit other than motor,	.. ..	270	13,000
Lubricating oil	.. ..	67,962,000	105,914,000
Gas oil,	.. ..	65,949,000	53,564,000
Fuel oil	.. ..	95,062,000	347,771,000
Other sorts	.. ..	24,000	71,000
		<hr/> 488,084,000	<hr/> 879,374,000

It will be seen that the imports were almost double, and it may be remarked that for this oil the country paid in 1920 over £66,000,000, by far the greater part of which was sent to foreign countries, although much doubtless returned to England in the form of dividends on British capital invested in the industry. The British Empire supplied less than 5 per cent. of the total imported

oil. How essential it is that the supplies of oil within the empire should be increased is sufficiently evident without comment.

During the critical period of the war, when sufficient supplies of oil were of extreme urgency, every effort was made to increase the British output, both from existing sources and from new and as yet untried directions. A Petroleum Research Department was formed for the purpose of ascertaining the character and extent of the mineral deposits of this country from which oil might be obtained. Careful investigation showed that a great quantity of valuable material, whether extracted from the mines and regarded as waste, or actually left in the mines, existed at every colliery, and plans were made for utilising this waste material and extracting the oil therefrom. This work of investigation was subsequently carried on by the Institution of Petroleum Technologists, and great progress has been made in the scientific and practical exploitation of many hitherto almost unsuspected sources of oil. The results of these investigations showed that there are in Great Britain great mineral deposits from which fuel-oil and motor spirit can be obtained, and that there are very large supplies of shales which can be made, and are so employed, to yield oil.

Outside the United Kingdom the action of the British Government in 1914 in securing a financial interest in the Anglo-Persian Company, dictated by the pressing need of obtaining supplies for the Navy, marked a definite advance in British policy. The country from which this oil is obtained—and the operations of the company are only at present in their infancy—is situated in the Bakhtiari region, in which the principal producing centre is the Maidan-i-Naftun field. Here pipe-lines have been laid for 145 miles to the great refinery on the island of Abadan, at the head of the Persian Gulf.

In Mesopotamia the existence of petroleum and asphalt has been known from the very earliest historical times, and an enormous petroliferous area follows the River Tigris to Mosul (hence the anxiety of the Turks to resume possession of this region), and continues at the neighbourhood of Van. Although the annual production is at present small, it is probable that the Mesopotamian fields will rival the Persian deposits,

which have increased their output from 243,000 tons in 1913 to 1,712,000 tons in 1920.

Within the British Empire, the principal fields are in India, where Burma and Assam have been producing oil for many decades; but the Indian demand exceeds the local supplies, and the export trade is comparatively small. Great efforts are being made, therefore, to exploit other areas, and both the Punjab and Baluchistan may now be regarded as potential producers. The annual output of India is about one million tons. Another producer in the East is Sarawak, where a refinery has been erected at Lutong, from which there is an increasing export of oil, reaching 148,000 tons in 1920; and there are extensive petroliferous areas along the north-east coast of Borneo in the adjacent British States of North Borneo and Brunei, as well as on the island of Labuan.

In Australia the production of oil is at present negligible, but great efforts are being made to find sources of supply, and to develop the shale deposits in New South Wales, Queensland, Western Australia, and Tasmania, while in Papua there are many indications suggesting the presence of oil-bearing strata, and developments are taking place. The Commonwealth Government have offered a reward of £50,000 for the discovery of petroleum in Australia, and various State Governments are giving bounties for the production of oil. Although many indications of oil have been found in South Africa, and bores have been made at various points, the prospects of the existence of crude petroleum do not appear to be promising, although it is believed that an oil-shale industry will prove successful. But in Canada the areas where oil indications have been met with are numerous, and regular production has been in progress in Ontario on a small scale for many years—the total Canadian output in 1920 being 28,000 tons.

There is every reason to believe that Canada will be eventually a valuable contributor to the world's oil-supply, but up to the present the great deposits which it was thought existed in the North-west Territories on the Mackenzie River, near Fort Norman, the discovery of which in 1920 caused such excitement, have proved disappointing. The Imperial Oil Company has expended

£600,000 in three years, and no oil has been struck except that in the original discovery, with the result that, for the time being, operations have been abandoned. It is by no means certain, however, that the optimistic and wonderful estimates of the value of these petroliferous areas of northern Canada will be falsified. Elsewhere in Canada there are large deposits of shale, and natural gas occurs in southern Ontario; at Monckton, New Brunswick; and in the Medicine Hat and Bow Island fields of southern Alberta, the production in 1920 being valued at over £800,000. The only other important source of supply in the British Empire—the oil deposits of New Zealand having proved disappointing up to the present, and those of Newfoundland and British Guiana being still in the category of unknown assets—is Trinidad. Here the Asphalt Lake has long been famous, but it was not until 1912 that the island commenced to export petroleum. The pitch lake has an area of about 100 acres, and there is a constant stream of pitch towards the sea, averaging from 15 to 18 feet in depth. The present output of oil is 297,000 tons, and it is steadily growing.

A word should be said about the giant concerns that dominate the petroleum market. The enormous amalgamation of capital known as the Standard Oil Company of New Jersey, formed by John D. Rockefeller, is, of course, with its subsidiary companies, the largest corporation dealing with the industry, and controls the great supplies of the United States. The largest British concern is the Shell Transport and Trading Company, amalgamated with the Royal Dutch Petroleum Company, with a capital of £43,000,000 (£26,365,000 fully paid), with subsidiary companies in Russia, Egypt, California, Trinidad, Mexico, Venezuela, Rumania, and the Dutch East Indies. The associated Anglo-Saxon Petroleum Company (capital £15,000,000) is responsible for the transportation of the petroleum products of the combine. The formation of the Shell Company was due to the initiative and enterprise of Sir Marcus Samuel, now Lord Bearsted. Another very important enterprise is the Mexican Eagle Oil Company, which was organised by Messrs. S. Pearson and Sons, with Lord Cowdray as chief. A subsidiary concern, the Anglo-Mexican Petroleum Company, deals with the importation and distribution

of Mexican petroleum products in the English market. The Burma Oil Company, controlling large areas in Burma and elsewhere, has great refineries at Rangoon and possesses considerable interest in the Anglo-Persian Oil Company. Its capital is £19,750,000, nearly all issued. The Anglo-Persian Oil Company, with a paid capital of nearly £20,000,000, controls the Persian fields, and has acquired the interests of three former German concerns. The British Government as already mentioned has a large financial interest in this company. There are numerous other oil companies, dealing with production, distribution, and marketing; but only a financial expert can determine the powers that are really pulling the strings of these companies and control the production and sale of petroleum.

CHAPTER XIX

MANUFACTURING PRODUCTION IN THE DOMINIONS

IN the preceding chapters the raw materials of the British Empire have been dealt with from the point of view of production, and mainly as they influence the industrial expansion of the United Kingdom. It has been seen that the empire contains vast stores of undeveloped and partly developed resources, differing greatly in their quality and character, according to the geographical position of the various Dominions and Colonies; that India alone has such immense potentialities that it may be regarded as an empire in itself, practically self-supporting in many important commodities; that the tropical dependencies offer unrivalled possibilities for the development of many agricultural products in constant and increasing demand; that the Dominions form the great reserve for our food supplies, and contain enormous tracts suitable for settlement; and that the whole empire could be, in fact, self-supporting and almost exclusive of the rest of the world were that economically possible, and politically desirable, which it is not. But there remains another important aspect of our imperial development—an aspect that is not altogether realised in the mother country and one which deeply affects not only the productive capacity of the empire as a whole, but directly concerns the industrial supremacy of the United Kingdom, and menaces—if due provision be not made for continuing and fostering the present flow of inter-imperial trade—the manufacturing prosperity of Great Britain.

While this country has been establishing her own industries, and developing the outposts of the empire in Africa and Asia, and aiding in the development of the Dominions by her capital and people, the Dominions on their part have been rapidly approaching the status of nationhood both politically and economically. One

of the tests of this new position is the advance that has been made by agricultural communities upon the paths of industrialism, and this test as applied to certain of the Dominions demonstrates conclusively that they have emerged from the pastoral and agricultural status into the more complicated sphere of modern industrial expansion. How far this new, and to many people, startling, development will affect the older established industries of the mother country depends in great measure upon economic factors that space forbids us to discuss; but it must be pointed out, if it is not already realised, that the present position is transitory, and that the Dominions, and especially Canada, as well as supplying us with vast quantities of our food and other products, have now become active competitors in the manufacturing sphere, supplying their own needs in increasing quantities, and, in some cases, especially in the case of Canada, exporting manufactured goods to Great Britain and other countries in direct competition with our home industries. This is a new phase of our imperial development which places these Dominions in a much stronger position as collective bargainers, and lifts them out of the rut of passivity upon the very active and intriguing stage of world economic policy. Upon the way in which these new conditions may be met and utilised, for the mutual benefit of the various parts of the empire, depends in the long run the future relations of its component parts, and not, as is so frequently taught and possibly believed, upon sentimental considerations of race, language, or common origin, all of which play a part in shaping our destinies as an empire, but not so conspicuous a part as is generally thought. It is not flag-waving or speeches at banquets that will keep the empire united, but mutual concession and mutual adjustment of the conflicting trade interests of its component parts.

Within the Dominions there are various great centres of population that can no longer be regarded as dependent, or even primarily dependent, upon the agricultural community. It is true that these great centres serve the needs of the surrounding agricultural population, and in return consume the products of the countryside; but they do so now very largely as manufacturing communities, and each great city is in itself, with few

exceptions, a miniature England sending forth its manufactured goods to the neighbouring territory. One of the direct effects of the development of manufacturing industries has been the concentration of population in those places that offer the greatest facilities for the production and distribution of particular commodities. In Australia, for example, the tendency has been to concentrate the manufacturing establishments in each metropolis, so that the growth of the capital cities has been accentuated when compared with that of the rest of the country. In this way, Sydney, Melbourne, and Adelaide appear to dominate the south-eastern portion of the continent, more especially the two former cities. In Canada the same tendency is observable, though to a lesser degree, for there, too, great cities have arisen that dominate the surrounding country, and attract to themselves population organised in manufacturing industries. These cities, however, are more widely distributed than is the case in Australia, and there are more of them, ranging in their order of manufacturing importance from Montreal, Toronto, Hamilton, Winnipeg, Vancouver, Quebec, Ottawa, and London, to Kitchener and Halifax.

One of the most remarkable effects of the war has been the stimulation of all kinds of productive effort in the Dominions, and this stimulation has not been a mere passing effect of the great demands that were imposed upon industrial effort in the Dominions owing to the inability of the United Kingdom to supply many of the manufactured goods that had previously been sent overseas, but may be regarded as a permanent quickening of the industrial pulse effecting a change in the productive capacity as manufacturing countries of both Canada and Australia, and in a lesser degree, South Africa and New Zealand. The actual laying down of expensive plant involving the employment of great sums of capital—in the case of Canada largely loaned from the United States—renders the continuance and further development of manufacturing industries assured. In Canada the transition from a status where agriculture predominated to one where the manufacturing industries are of the greater importance has been quicker than might have been anticipated a few years ago; but unquestionably this development had to come, and as

unquestionably the disparity between manufacturing industry and agriculture will be a constantly widening one, although, of course, agriculture, with all its kindred activities, will necessarily remain a fundamental industry of the Dominion. The realisation of this fact will do much to render intelligible the relations between Canada and this country, and also between Canada and the United States.

The industrial expansion of Canada has not been, of course, entirely a matter of domestic concern, since much of the capital that has been employed in building up Canadian manufactures has been obtained from outside sources, and many of the factories and works are branches of businesses established in the United States and Great Britain. It is unfortunate, perhaps, that the Americans have obtained so firm a position in the Dominion with their numerous branch factories, which greatly outnumber those established by English firms. The reason for this predominance of American industrial interests in Canada—a predominance, of course, only so far as English firms are concerned—are fairly obvious. Americans have been quick to realise the great potential resources of the Dominion, and finding themselves affected adversely by the existing tariff arrangements, designed to foster Canadian industry, they have erected their factories and plant across the borders, partly to secure a hold on the Canadian market and escape the Canadian tariff, and partly to enjoy the preferential treatment accorded to Canadian goods by many countries within the empire, and by France.

British firms, on the other hand, have been slow to realise, or, at any rate, to act upon the realisation, the advantages of Canada as a manufacturing country, and English branch factories are comparatively few in number. Within the past few years there has been a great increase of branch factories in Canada, and it has been computed that in 1919 more than two hundred were opened by Americans, and that in 1922 there were over seven hundred such establishments. The extraordinary investment of American capital in Canada has been one of the outstanding features of the last decade. In 1919 it was stated that American capital practically controlled the motor-car accessory, proprietary medicine, and artificial abrasions industries; while the motor-car industry was divided in the proportion of 61 per cent.

American and 49 per cent. Canadian capital. Over 40 per cent. of the electrical apparatus, meat-packing, rubber, paint and varnish, brass and copper, condensed milk, and refined petroleum industries was United States owned.¹

It must be remembered that these are large industries, and that, for example, Canada is now exporting motor-cars (over 13,000 in 1922), large numbers being sent to this country. The American capital invested in the Dominion is enormous, and it is computed that the total is about £500,000,000, almost as much as the British capital invested in the country—American capital employed in the manufacturing and industrial enterprises probably being much greater than British, which is largely invested in Government, Provincial, and Corporate securities. For instance, it is estimated that about £50,000,000 of American money is invested in the Canadian pulp and paper industry, or about 80 per cent. of the capital employed in that industry.

This process of Americanising Canadian industry is a very serious problem within the empire. It does not mean, of course, any closer political relations between the two countries, but it does involve the closest trade relationship, and seems also to imply the loss of the Canadian market to British goods, if we do not establish more of our own factories in Canada, and thus indirectly reap the benefit of Canada's remarkable manufacturing facilities, and at the same time take steps to push British goods by more effective salesmanship and advertising. At the present time, nearly all advertising is American, and Canadians who might wish to purchase British goods are always confronted by American advertisements. To put the matter concisely, unless the share held by the United States capital in the control and exploitation of the majority of Canadian manufactures and raw materials is to be predominant, British enterprise and British capital must assume their share of both the responsibility and the reward.

The net result of our indifference in the past, and of our inability during the war to supply the goods that were formerly sent to Canada, is that the British goods exported to the Dominion are now less than 16 per cent. of the imports, as against 69 per cent. from the United

¹*Annals of the American Academy of Political and Social Science*, No. 196.

States ; our balance of trade is entirely on the wrong side, for we are taking from Canada far more than we sell, and Canada is commencing to export to Great Britain increasing quantities of manufactured articles, and is at the same time consuming ever larger quantities of American goods. This consumption of United States goods, states a report issued by the Canadian Department of Trade, "is in face of a direct, unquestioned, and substantial preference for British goods, the high premium on United States funds, and a non-preferential tariff from the United States. It may be almost wholly accounted for by proximity and aggressive salesmanship."

We may briefly allude to some of the principal Canadian manufactures : their growth can be studied in detail in the Commercial Series of pamphlets issued by the Canadian Department of Trade. The motor-car industry is firmly established, and big American firms, like the Ford Company, have their branch factories on Canadian soil. In the production of rubber goods, Canada now ranks fourth among the countries of the world, and imported in 1920 an amount of crude rubber only exceeded by the United States, Great Britain, and France. In 1919, the Dominion sold Canadian-made tyres to the value of £6,200,000, and mechanical rubber goods to the value of £4,600,000, exporting rubber goods to the value of £1,600,000. The woollen industry is firmly established, the production of woollen goods, yarns, and felt being valued at £8,000,000. There are also important cotton mills, which produce both for domestic and foreign consumption, the total value of the output in 1920 being £18,400,000. The boot and shoe industry produced over 19,000,000 pairs in 1919, and is one industry in which Canadian capital is almost exclusively employed. Canadian boots are exported to many countries, over £1,135,000 worth being sent abroad in 1919-20, more than half coming to the United Kingdom. Here is seen, as in the motor-car and other trades, Canadian industry directly competing with the manufactures of Great Britain. In the production of iron and steel, Canada has established a very important industry, and though she is at present only able to cope with a part of the demand for rolling-mill products, engines, and boilers, the industry is steadily growing, and the time cannot be

far distant when the Dominion will make most of the goods that do not require a highly specialised plant for their manufacture. The building of ships is also an important industry, and Canada has made remarkable progress since 1914, standing sixth in tonnage among the nations. There are seventeen shipyards in the Dominion, employing more than 20,000 men, and the Canadian Government owns a mercantile marine of its own, operated by the management of the Canadian National Railways. Of the following goods manufactured in Canada, she exports more than she imports: cutlery, fire-arms, motor-cars, locomotives, ploughs, harvesters, mowing machines, threshing machines, hardware, aeroplanes, railway cars, paper, ships, boots and shoes, pneumatic tires, explosives, fertilisers, and paints and varnishes. This is a remarkable record, and shows the great progress of the Dominion within the past decade.

The position of Australia as a manufacturing country is, of course, different from that of Canada, owing to the fact that there is no United States contiguous to the continent. Great progress has been made, however, in manufacturing industries, and local manufactured production advanced in the five years preceding the war by £62,000,000, and since the commencement of the war it has increased by no less than £163,000,000. Due allowance must be made for the increase of prices. The position of Canada, Australia, South Africa, and New Zealand as manufacturing countries is shown in the following figures:—

Year	No. of Factories	Em- ployees.	Value of Output.	Imports from United Kingdom.	Imports from United States.
<i>Canada—</i>					
1912-13	19,218	515,000	£233,000,000	£27,000,000	£88,000,000
1916-17	21,306	514,883	281,000,000	21,000,000	134,000,000
1922,	38,344	682,000	704,000,000	23,000,000	143,000,000
	(1919)	(1919)	(1919)		
<i>Australia—</i>					
1910,	13,822	286,000	99,000,000	*34,000,000	*9,000,000
1920-21,	17,113	386,000	324,000,000	77,000,000	36,000,000
<i>South Africa—</i>					
1913,	1,645	....	....	22,000,000	3,776,000
1920-21,	7,005	179,000	98,000,000	33,829,000	8,327,000
<i>New Zealand—</i>					
1910,	3,519	46,000	29,534,000	10,498,000	1,399,000
1920-21,	4,804	78,853	82,473,000	21,448,000	7,746,000

*Yearly average, 1909-1913.

The growth of manufacturing industry in Australia has been specially marked since the abolition of inter-colonial tariffs consequent upon the creation of the Commonwealth in 1901, when, the whole of the Australian markets being opened to the industrial products of each State, the internal distribution of the products of Australian industry was greatly facilitated. Called upon during the war to equip and despatch a large army to Europe, the Australian people, like the Canadians, started many new lines of manufacture to relieve the shortage of imports. Most of the new factories that were then started continue to expand under peace conditions, and it is the ambition of the Commonwealth to become the industrial centre of the South Pacific, and to manufacture goods that may be sent overseas. This she may well become owing to her vast supplies of iron and coal, her unrivalled stores of wool, and the fact that she is in a position to grow both temperate and tropical products on a vast scale. The only factors wanting are population and the ability to develop the tropical north of her great territories.

The greater part of Australian exports are still those based upon her primary products, but in certain industries the Commonwealth is beginning to produce beyond her own requirements, and Australian steel has been sent to South Africa and the East, rubber tyres are being exported, harvesters and agricultural machinery are being sent to several countries, and there is a considerable export to New Zealand, South Africa, Papua, and Fiji of apparel and textiles, arms and weapons, boots and shoes, india-rubber manufactures, furniture, jewellery, paints and varnishes, machinery, and rails. The growth of this inter-imperial trade in Australian products is a most satisfactory feature of Australian industry. The total value of exports of Australian produce to New Zealand in 1920-21, much of it being manufactured goods, was £6,271,000, to South Africa, £3,025,000, and Straits Settlements, £2,057,000.

The wide range of Australian manufacturing industries, though not at present so great as that of Canada, demonstrates the growing importance of the Commonwealth as a manufacturing country. The whole question of the manufacturing capabilities of Australia has been

exhaustively dealt with in the valuable and detailed reports (over 347 separate reports have been issued) on each industry, prepared in 1915-16, when the revision of the tariff was under consideration. In certain large and firmly established industries, Australian goods are defying outside competition, and in other new industries the tariff is arranged, or bounties are provided, so as to set the infant manufacture upon its feet. It is thus with the new woollen industry. Shortly before the war, several companies began combing wool and exporting tops, and the government has now established extensive mills of its own and gives a bonus of one penny per pound on all combed wool, or tops locally produced, the national desire being not only to provide the Australians with the whole of their woollens, but also to utilise the enormous wool clip so as to export the finished article overseas.

With regard to South Africa and New Zealand, the same process is at work, although the emergence from the purely pastoral, agricultural, and mining state of development into the manufacturing sphere is necessarily slower in these countries. Both are manufacturing many articles for their own consumption, and both are destined in time to exchange manufactured goods with other countries. In any case, the fact must be recognised that one of our Dominions is a great manufacturing country already exporting largely of her surplus manufactured products, and entering into competition with the mother country; that another is supplying many of the goods needed for her own consumption, and is commencing to export manufactured goods; and that two others have passed the first stage of their development, and have started small manufacturing industries of their own—boots and shoes, furniture, wagons, soap, and similar products that can be made easily on the spot. The problem of inter-imperial trade is complicated by these developments, but it cannot be expected that the United Kingdom shall always remain the manufacturing centre for the empire as was the ideal of British statesmen until the repeal of the Navigation Laws set imperial relations upon a new basis. The time for bargaining and mutual concessions has arrived, and the future trade relations between Great Britain and the Dominions will be influenced by other than purely sentimental considerations.

APPENDIX I

BIBLIOGRAPHY

THE principal publications consulted in the preparation of this volume have been the very numerous official reports issued by the British and the various Overseas governments. These contain a mass of information regarding the economic position of the British Empire. So far as the Dominions are concerned, there is, as a rule, ample material in the official year-books, although these differ considerably in methods of arrangement and value of contents. The best is that issued by the Commonwealth of Australia, followed closely by that of the Union of South Africa. The year-book of the Dominion of Canada is scarcely worthy of so prosperous a country. These year-books generally contain particulars of the physiography, climate, constitution, and social and political progress of the particular Dominion, with summaries of its trade and production, accompanied by special articles on topics connected therewith.

In addition to the year-books published by the federal governments, there are also, in many cases, similar annual publications issued by the state or provincial governments, such, for example, as those of Quebec, New South Wales, and Victoria. These supplement and extend the information contained in the federal year-book. Much of this condensed information is elaborated in the numerous reports, departmental or otherwise, issued by the Dominions and their States and Provinces. Special reference may be made to those published in Canada, which form a most extensive series extending to many volumes annually. The Department of Trade and Commerce, for instance, issues an extensive annual report (purely statistical), containing the latest trade information, as well as numerous special reports on specific industries. In addition, many of the provincial departments publish lengthy reports, and special mention

must be made of the publications of the Departments of Mines, both federal and provincial. A complete list of these, and the following publications, is beyond the possibilities of this book ; but it may be mentioned that the great majority, running into many hundreds of reports annually, are contained in the Library of the Royal Colonial Institute, where they may be consulted by Fellows and accredited inquirers.

In the case of the Crown Colonies, each issues an annual Blue Book containing the latest statistical information. Upon this are based the annual reports issued by the Colonial Office. These Blue Books are drawn up in a prescribed form and the information they contain can frequently be used for purposes of comparison. Most of the Crown Colonies also publish departmental reports, differing in scope and importance according to the size and development of the colony. These reports cover such subjects as mining, agriculture, forestry, fisheries, railways, education, native administration, public health, and a variety of administrative topics ; and in some colonies, such as Nigeria and the Gold Coast, they are supplemented by an annual address by the Governor to the Legislative Council, which is frequently a highly important review of the progress of the colony during the preceding year. In addition to these annual reports there are numerous special reports of Commissions dealing with specific subjects, or of officials or experts appointed to inquire into a special question. Some of the Crown Colonies issue good year-books, or other occasional handbooks, either officially or as private ventures, and among the best may be mentioned those of the Gold Coast, Nigeria, Uganda, Ceylon, Cyprus, Jamaica, St. Kitts-Nevis, Trinidad, British Guiana, and Barbados.

With regard to India there is a great mass of statistical information contained in the Annual Reports on Trade and Shipping, and other similar publications, but in addition there are the Administrative Reports of the Provincial Governments and also of some of the semi-sovereign States, which review the progress of the administrative unit during the year. Recently there has been issued a special report, prepared for presentation to Parliament, on the progress of India during the

preceding year, which forms a valuable survey of Indian social, political, and economic development.

In addition to all this material there are the printed debates of the Dominion Parliaments, the State and Provincial Legislatures, and, occasionally, of the Legislative Councils in the Crown Colonies, as well as of the Indian Legislature and of the Indian Provincial Legislatures. Important political proceedings are summarised in the excellent *Journal of the Parliaments of the Empire*, issued by the Empire Parliamentary Association.

With regard to the empire generally, there is the Annual Statement of Trade prepared by the Board of Trade, but actual reports on particular trades, industries, and occupations are notable by their absence. The *Board of Trade Journal* to some extent fills this gap. There are, however, numerous reports issued by the Department of Overseas Trade, dealing with specific Dominions and Colonies, which form a very valuable source of information. One—Report on the Economic and Commercial Conditions of the Dominion of New Zealand—may be noticed as a sample of many similar publications.

For a general survey of the economics of the Dominions there are the admirable reports issued by the Royal Commission on the Natural Resources, Trade, and Legislation of the Dominions, in 1912-1918, but there is no similar review of the Crown Colonies.

Among books that have been found useful in the preparation of this volume, J. C. Cunningham's *Products of the Empire*, an excellent summary issued by the Clarendon Press in 1921, should be mentioned, together with the following:—

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APPENDIX II

STATISTICS

THE following figures, showing the exports of produce, with the exception of manufactured goods, from the Dominions, Colonies, and India, have been compiled from the actual trade statements of the various countries concerned, which are contained in numerous Blue Books and Annual Reports. They differ, therefore, considerably from the figures as shown in the Board of Trade Returns, and they represent, the compiler believes, the first attempt to show the principal products of the overseas empire in this form. They do not represent the actual production of raw materials, but show the exportable surplus in each case.

In the present state of statistical science, it is impossible to secure any degree of accuracy in these figures. Not only have the different currencies to be brought to as accurate a standard as possible but sometimes the figures quoted are purely conventional values and do not represent the actual worth of the commodities. In the question of quantities, moreover, there is abundant scope for error, as there is no standardised system of weights and measures for the whole empire. Metric tons and long tons are frequently used indifferently; pounds and kilograms, and many local weights having no precise equivalent in English are quoted in different colonies; and in not a few cases the same commodity is estimated by bulk, weight, or measure. It is impossible therefore to reduce these quantities to a common standard without involving an extensive and prolonged correspondence.

Moreover, the classification of commodities differs in many countries, and in the absence of definite descriptions it is frequently impossible to determine the actual commodity. In addition, in different parts of the empire a different meaning is attached to the words "local produce." No one, for example, would believe

that Canada produces large quantities of rice, in spite of the fact that the latest Canadian export figures include over two million pounds of rice as "Canadian produce," simply because, presumably, it has been cleaned in the country.

It is impossible, therefore, to secure accuracy in figures like the following. They are only intended to be a rough guide to the exportable commodities of the overseas empire and accuracy can only be attained if, and when, statisticians tackle the vastly complicated and entirely unsatisfactory system, or want of system, in the statistics of the British Empire.

The figures immediately following the name of the product represent the values of the product imported into the United Kingdom in the year 1921, according to the Board of Trade returns, the first being the value from foreign countries, the second the value from British countries, and the third being the total.

The years 1913 and 1921 have been chosen as the most suitable for purposes of comparison.

In the columns under the name of the product the figures in the first column are the total value of the product exported from a specific British country, according to its own returns, in the year 1913; in the second column they represent the value sent to the United Kingdom in the same year, in the third and fourth columns the values for the year 1921 are represented, and in the fifth and sixth columns the amounts (weight, bulk, etc.) in the years 1913 and 1921 respectively.

CONTRACTIONS. t=tons; c=hundredweights
lb=pounds; g=gallons; b=bushels

AJWAN SEEDS

	1913	1913	1921	1921	1913	1921
India ..	2,983	—	—	25,646	489t	1384t
	£	—	£	25,646	—	—
				303		
				489t		
				1384t		

Source of antiseptic thymol, q.v.

ALCOHOL (WOOD)

Canada ..	—	—	149,645	34,773	—	411,296g
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ALOES

2,421 + 9,912 = 12,333

S. Africa ..	8,003	4,738	4,293	962	313t	295t
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AMBERGRIS

Newfoundland..	26,800	4,400	—	—	14,516oz.	—
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ANISEED

India ..	961	—	4,922	387	56t	113t
Cyprus ..	1,849	—	1,855	237	94t	64t

ANNATTO

Jamaica ..	4,862	132	—	—	347t	—
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APPLES

3,850,650 + 3,542,279 = 7,392,929

Canada ..	852,327	762,560	1,659,818	1,580,402	—	—
Anstralia ..	325,131	171,449	803,286	768,858	—	—
N. Zealand ..	12,160	1,432	23,590	20,351	—	—
S. Africa ..	1,239	—	4,355	388	—	—

ARECANUTS

	1913	1913	1921	1921	1913	1921
B. Malaya ..	£	£	£	£	—	—
Ceylon ..	202,608	142	463,693*	330,307	5,102t	150,890* pikuls
India ..	8,224	—	15,013	211	—	6,552t
						196t
						* Balance of exports.

676 + 26,801 = 27,477

ARROWROOT

S. Vincent ..	55,605	44,923	21,216	11,105	1,931t	934t
Australia ..	306	—	1,680	228	19t	31t
S. Africa ..	1,443	1,443	—	—	28t	—
Bermuda ..	475	—	—	—	—	—
Barbados ..	21	—	—	—	it	—
Fiji ..	61	—	—	—	—	—

591,288 + 196,838 = 788,126

ASPHALT

Trinidad ..	230,565	38,269	88,825	36,628	230,565t	56,779t
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BALATA

B. Guiana ..	153,692	137,487	195,479	195,473	590t	632t
Trinidad ..	245	—	1,379*	1,142*	13t	4t*
						* See also GUTTA PERCHA.
						* Year 1918.

BANANAS

Jamaica ..	988,236	35,324	1,543,672	213,660	11,597,881 stems	9,959,144 stems
Fiji ..	168,248*	—	73,600	—	—	582,925 stems
B. Honduras ..	29,503	—	43,964†	—	617,537 stems	887,481 stems
Trinidad ..	9,765	9,705	—	—	72,311 packages	—
Barbados ..	669	669	—	—	4,734 crates	—
S. Africa ..	763	—	—	—	—	—
Australia ..	—	—	6,457	—	—	4,987 centals
Leeward Is. ..	31	—	156	—	—	—
S. Lucia ..	19	—	191	—	1,246 stems	2,616 stems
Bahamas ..	8	—	—	—	185 stems	—
						* Includes all fresh fruit in 1913.
						† Year 1917.
						5,985,285 + 667,731 = 6,653,016

BARK (FOR TANNING)

12,400 + 133,225 = 145,625

	1913	1913	1921	1921	1913	1921
	£	£	£	£		
S. Africa ..	309,329	208,192	457,318	20,588	65,052t	71,376t
Australia ..	59,393	1,010	12,200	I	7,106t	876t
Canada ..	5,908	—	—	—	—	—

Mainly Wattle. For other barks, see under their names.

BARK EXTRACT

S. Africa ..	—	—	112,809	72,296	—	4,883t
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BARLEY

8,137,031 + 2,392,350 = 10,529,381

Canada ..	770,330	663,234	2,291,810	2,112,219	6,455,975b	8,503,533b
India* ..	1,043,790	817,592	203,623	—	150,409t	9,531t
Australia ..	1,069	804	778,615	439,003	165t	71,645t
N. Zealand ..	959	I	9,477	9,348	4,747b	19,729 centals
Cyprus ..	37,747	2,122	—	—	314t	—
S. Africa ..	222	2	—	—	28t	—

* Bengal, £281,083
Sind, 714,448
Bombay, 48,138

BEANS *

India † ..	711,009	284,979	1,345,039	353,237	114,628t	80,360t
Canada † ..	42,312	8,659	169,487	36,840	94,546b	160,525b
Australia ..	3,801	1,393	136,133	131,150	5,928 centals	172,120 centals
N. Zealand ..	89,124	79,525	120,317	100,499	339,998b	125,485 centals
Cyprus † ..	1,670	—	2,212	112	194t	131t
Tanganyika ..	—	—	7,886	—	—	508t
Canada § ..	1,965	—	12,960	20	3,759b	14,376b
Trinidad ..	493	—	—	—	81t	—
Fiji ..	—	—	1,242	—	—	36t

* Including in certain cases Lentils, Gram, Peas. See also Pease. † Exclusive of Gram, q.v. ‡ Peas. || Exclusive of Carobs, q.v. § Haricot Beans.

BENISEED

	1913	1913	1921	1921	1913	1921
Nigeria	£	£	£	£	—	—
Sierra Leone ..	9,245 460	7,827 130	16,918 421	14,858 1	—	1,196t 37t

BITTERS

Trinidad ..	32,234	12,233	25,960*	4,780*	—	—	* Year 1918.
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BLASTING COMPOUNDS

S. Africa	36,567	—	175,813	3	472t	1,643t
Canada ..	22,466	2,218	254,140	—	—	—

BUCKWHEAT

Canada ..	23,715	10,686	68,509	4,405	223,823b	271,838b
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BUCHU LEAVES

S. Africa ..	32,071	21,047	21,257	6,349	73t	55t
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BUTTER

N. Zealand	2,061,651	1,576,912	11,169,530	10,953,941	18,613t	44,924t	* Exclusive of Ghee, q.v.
Australia	3,564,925	3,180,932	7,968,078	6,906,298	33,037t	56,808t	
S. Africa	2,979	5	249,872	238,086	20t	1,176t	
Canada	46,715	34	1,025,766	203,987	369t	4,348t	
S. Rhodesia	—	—	47,165	16,181	—	188t	
S. W. Africa	—	—	26,117	—	—	148t	
India*	38,986	—	67,205	775	313t	244t	

CAMPHOR

135,316 + 20,561 = 155,877

	1913	1913	1921	1921	1913	1921
B. Malaya ..	£ —	£ —	£ —	£ —	—	—
India † ..	5	—	10,355*	5,133	50lb.	1,030 pikuls 58t
Hong Kong ..	—	—	5,818	20,210*	—	—
B. N. Borneo ..	2,672	No figures	3,847	No figures	—	—
Sarawak ..	300	No figures	1,644	No figures	—	—

* Balance of exports.
† All from Madras.
‡ Board of Trade figures.

CARDAMOMS

India ..	49,994	11,782	77,414	13,823	165t	271t
Ceylon ..	62,156	21,358	53,653	12,551	202t	275t
B. Malaya ..	—	—	3,875*	—	—	—
S. Settlements	2,089†	—	—	—	212† pikuls	—

* Balance of exports.
† Balance of exports.

CAROBS OR LOCUST PODS

10,596 + 295,506 = 306,102

Cyprus ..	179,027	97,587	305,479	180,849	44,989t	74,911t
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CASEIN

106,812 + 146,855 = 253,667

N. Zealand ..	6,452	—	114,511	108,078	214t	1,653t
Australia ..	—	—	36,376	2,689	—	—
India ..	—	—	13,770	13,194	—	245t

CASHEW NUTS

Jamaica ..	87	186	591	—	26 packages	—
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CASSIA

India ..	27	—	—	—	1,596 lb.	—
S. Lucia ..	—	—	9	9	—	1,550 lbs.

CASTOR OIL

25,714 + 2,656 = 28,370

	1913	1913	1921	1921	1913	1921
India ..	92,504	8,907	41,115	6,866	1,007,001g	193,459g

CASTOR OIL CAKE

India ..	—	—	7,399	—	—	854t
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CASTOR OIL SEED

72,276 + 145,174 = 217,450

India *	1,336,649	544,316	1,040,735	247,058	128,615t	48,798t
Uganda	65	—	302	—	16t	13t
Nyasaland	327	17	—	—	35t	—
Jamaica	17	17	—	—	—	—
Seychelles	—	—	9	—	—	1,870lb

* Bombay = £1,159,021 in 1913

CHEESE

1,314,320 + 15,910,637 = 17,224,957

N. Zealand	1,770,297	1,760,514	8,199,183	8,191,233	—	68,439t
Canada	4,139,428	4,099,439	7,429,344	6,804,919	63,043t	59,651t
Australia	42,030	37,206	438,350	412,443	590t	5,656t
S. Africa	—	—	27,212	13,800	—	199t
Cyprus	9,268	—	5,552	1	184t	38t
S. Rhodesia	—	—	3,132	—	—	15t
India ..	126	—	805	—	—	3t
Malta ..	6,820	—	831	—	—	14t

CHILLIES

India ..	134,220	93	401,926	6,962	7,189t	7,196t
Uganda	8,247	No figures	30,213	No figures	360t	367t
Nyasaland	3,166	2,908	—	—	75t	—
Zanzibar	1,048	607	—	—	34t	—

CIDER

	1913	1913	1921	1921	1913	1921
Canada ..	£ 4,453	£ 4,403	£ 10,513	£ —	—	72,544g

CINCHONA BARK

India*	8,289	8,289	10,435	10,435	270t	104t	* All from Madras.
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98,597 + 39,484 = 138,081

CINNAMON

Ceylon ..	160,907	14,144	179,515	6,325	—	2,265t
India ..	1,015	614	329	—	17t	5t
Seychelles ..	—	—	409	—	—	—
S. Lucia ..	—	—	22	—	—	780 lb.

762 + 9,384 = 10,146

CINNAMON OIL AND CINNAMON LEAF OIL

Seychelles ..	798	234	12,932	9,978	—	29,369 litres
Ceylon ..	1,402	392	12,357	7,230	68,204 oz.	243,450oz.
India* ..	—	—	6,149	6,142	—	2,735g

* All from Bombay.

CITRONELLA OIL

Ceylon ..	110,181	46,631	109,381	19,891	732t	518t
India* ..	—	—	12,560	12,160	—	9,846g

* All from Burma.

CLOVE OIL

Seychelles ..	—	—	3,451	393	—	8,347 litres
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CLOVER SEEDS

	1913	1913	1921	1921	1913	1921
Canada ..	£ 147,675	£ 62,126	£ 334,803	£ 141,336	69,149b	115,978b
N. Zealand ..	60,492	28,622	156,114	70,179	1,779t	1,866t

2,773 + 308,222 = 310,995

CLOVES

Zanzibar ..	412,547	67,089	765,553	264,860	7,952t	8,364t
India ..	231	—	275	—	4t	1·8t
Ceylon ..	501	17	609	40	6t	5t
Seychelles ..	27	—	—	—	9t	—

211,992 + 2,648,164 = 2,860,156

COCOA

Gold Coast ..	2,489,218	1,322,112	4,764,067	1,764,674	50,911t	133,195t
Trinidad ..	1,403,397	114,502	1,547,085*	290,171*	21,480t	26,177t
Nigeria ..	157,479	85,591	435,860	261,358	1,986t	17,944t
Ceylon ..	201,397	128,906	201,884	55,242	3,426t	3,112t
Grenada ..	303,073	174,915	185,193	137,257	5,264t	4,371t
Jamaica ..	114,738	59,962	97,439	59,080	2,318t	3,248t
Leeward Is.† ..	24,543	22,748	36,613	19,577	478t	362t
S. Lucia ..	38,888	16,219	25,211	11,820	729t	618t
S. Settlements ..	9,293‡	50	—	—	—	—
B. Malaya ..	—	—	9,118†	—	—	—
B. Honduras ..	4,972	1,757	269||	—	17t	5·5t
Fiji ..	74	—	—	—	1t	—
Seychelles ..	30	30	—	—	·75t	—
Uganda ..	—	—	1,475	—	—	16t
Mauritius ..	44	44	—	—	6t	—
B. Guiana ..	1,328	1,188	—	—	25t	—

* Year 1918.

† All from Dominica.

‡ Balance of exports.

|| Year 1917.

COCONUTS

	1913	1913	1921	1921	1913	1921
	£	£	£	£	Numbers in thousands	
Jamaica ..	135,486	—	145,346	39,652	—	* Year 1918.
Trinidad ..	85,369	1	145,721*	21,145*	16,390	† Balance of exports.
S. Settlements ..	35,470†	50	—	—	—	‡ Year 1917. :
B. Malaya ..	—	—	40,753	3	—	
B. Honduras ..	30,934	—	31,464†	—	5,892	
Ceylon ..	99,430	59,990	91,036	35,195	16,861	
Zanzibar ..	5,903	—	2,989	2,985	—	
B. Guiana ..	3,038	116	10,052	—	875	
India ..	1,517	—	4,378	9	344	
Leeward Is. ..	1,671	152	4,770	—	—	
Seychelles ..	365	103	1,914	—	103	
S. Lucia ..	234	14	900	6	70	
Grenada ..	316	—	65	—	106	
Australia ..	—	—	4	4	—	
Bahamas ..	127	—	—	—	46	
Tanganyika ..	—	—	154	—	—	
					32	

COCONUT OIL

	1913	1913	1921	1921	1913	1921
	£	£	£	£		
Ceylon ..	1,115,847	397,325	1,502,450	829,574	27,349†	24,236†
B. Malaya ..	—	—	340,546*	—	—	132,359* pikuls
India ..	155,073	31,759	267,566	168,346	1,091,477g	992,139g
S. Settlements ..	230,025*	—	—	—	97,212 pikuls	—
Mauritius ..	6,347	—	10,090	5,215	169,292 litres	199,100 litres
Australia ..	85,552	37,903	4,639	1,680	1,976†	90†
Seychelles ..	1,707	—	4,640	1,085	—	—
B. Guiana ..	—	—	3,226	—	—	—
Trinidad ..	221	—	431†	—	1,084g	15,934g
Tanganyika ..	—	—	438	—	—	1,568g†
Zanzibar ..	—	—	1,145	84	—	1,471g
						50,905lb.

1,510,990 + 1,390,510 = 2,901,500

* Balance of exports

† Year 1918.

COD OIL

	1913	1913	1921	1921	1913	1921
Newfoundland	77,325	£	118,819	£	4,118t	5,837t
"	3,402*	647*	5,653*	889*	26,218g*	28,265g*
Canada ..	105,631	730	17,445	—	1,892,978g	98,303g

* Refined.

COFFEE

1,349,403 + 1,062,079 = 2,411,482

	1913	1913	1921	1921	1913	1921
India ..	1,024,402	368,402	1,390,803	528,275	12,995t	11,753t
Kenya ..	—	—	480,846	88 per cent.	—	5,471t
Jamaica ..	158,578	16,338	161,447	12,500	2,909t	3,226t
Uganda ..	23,217	No figures	94,038	No figures	612t	2,442t
Tanganyika ..	—	—	88,682	18,695	—	1,654t
B. Guiana ..	2,225	2,152	5,569	1,966	39t	180t
F. M. S. ..	43,392	No figures	—	—	12,247 pikuls	—
Nyasaland ..	4,868	4,035	2,260	2,200	87t	40t
S. Africa ..	1,490	2	4,215	—	16t	28t
Ceylon ..	518	53	4,599	3	7t	78t
S. Rhodesia ..	341	2	569	—	2t	3t
Trinidad ..	71	11	110*	—	1t	2t*
Nigeria ..	217	185	—	—	4t	—
Sierra Leone ..	598	—	4	—	—	—
Leeward Is. ..	28	25	26	—	1,120lb.	1,467lb.
Grenada ..	8	8	87	12	—	—
Seychelles ..	2	—	—	—	62lb.	—
Mauritius ..	54	—	—	—	1,806lb.	—

* Year 1918.

COHUNE NUT

	2,420	2,416	155*	28ot	9t*	* Year 1917.
B. Honduras ..	—	—	—	—	—	—

COIR*

5,005 + 393,494 = 398,499

	1913	1913	1921	1921	1913	1921
India ..	604,190	£	926,006	£	366,869	28,166t
Ceylon ..	208,590		177,855		38,968	13,48t
Fiji ..	—		400		—	16t

*And Coir yarn and rope

COPRA

366,750 + 1,382,878 = 1,749,628

	1913	1913	1921	1921	1913	1921	
Ceylon ..	1,397,285	2,001	2,430,448	1,823,811*	199,661	55,864t	68,371t
B. Malaya ..	—	—	1,823,811*	—	—	—	1,069,354* pikuls
Zanzibar ..	162,632	—	333,671	—	24,696	7,100t	16,843t
Fiji ..	176,741	36,518	282,768	—	159,769	7,929t	14,530t
India ..	1,030,826†	9,308	123,194	—	29,479	38,691t	4,611t
Tanganyika ..	—	—	103,772	—	10,644	—	3,491t
S. Settlements ..	52,309*	104,915	—	—	—	62,472* pikuls	—
F. M. S. ..	180,893	No figures	—	—	—	156,034 pikuls	—
Trinidad ..	11,545	8,936	77,947†	2,451†	2,451†	515t	2,335t
Seychelles ..	72,049	14,127	57,681	8,884	8,884	2,937t	2,637t
Mauritius ..	2,910	1,290	5,548	5,548	5,548	97t	192t
B. N. Borneo ..	6,133	No figures	49,763	No figures	No figures	—	—
Jamaica ..	607	603	20,297	8,813	8,813	30t	629t
Gold Coast ..	14,291	38	10,489	2,297	2,297	619t	443t
Sarawak ..	—	—	5,993	—	—	—	—
Nigeria ..	1,890	202	2,618	2,618	2,475	96t	166t ||
B. Honduras ..	—	—	2,590 ||	—	—	—	86t ||
S. Vincent ..	—	—	1,358	—	203	—	39t
B. Guiana ..	1,369	1,283	960	960	960	56t	39t
S. Lucia ..	68	10	419	419	362	3t	14t
Grenada ..	—	—	258	258	238	—	8t
Leeward Is. ..	2	1	—	—	—	—	—
Australia ..	—	—	6	—	—	—	—

* Balance of Exports.

† Madras, £1,036,269.

‡ Year 1918.

|| Year 1917.

CORIANDER

	1913	1913	1921	1921	1913	1921
India ..	£ 39,099	£ 2,181	£ 123,582	£ —	4,776t	4,429t

49,353.532 + 1,820,668 = 51,174,200

COTTON

India*	27,361,655	957,351	53,968,279	632,393	531,315t	553,802t	1913 *Bengal, 1,349,191 Bombay, 19,805,459 Sind, 3,733,475 Madras 1,059,746 Burma, 403,784
Uganda	317,687	No figures	1,281,357	59 per cent	6,467t	14,529t	
Kenya	—	—	—	415,134†	—	—	
Sudan ..	151,926	50,856	378,893	No figures	52,162 kantars	4,932t	
Nigeria	159,122	158,991	369,290	369,290	2,872t	5,721t	
Tanganyika	—	—	119,255	48,377	—	512t	† Board of Trade figures, probably includes a large amount from Uganda.
Leeward Is.†	67,501	67,501	168,541	168,541	549t	471t	
S. Vincent	36,190	36,190	71,213	70,467	225t	285t	
Nyasaland	83,868	83,331	66,559	66,078	1,293t	533t	
Australia ||	2,192	2,192	64,250	64,250	37t	386t	
S. Africa	811	587	36,527	26,315	14t	408t	1913 *Antigua, 16,362 S. Kitts, 80,262 Montserrat, 68,952 Virgin Is. 2,965 || Nearly all from Queens-land.
Cyprus	40,693	85	11,223	—	672t	165t	
Malta ..	7,022	—	1,470	10	—	96t	
Grenada	10,499	10,499	8,817	8,817	179t	146t	
Barbados	23,460	23,460	6,498	5,915	193t	31t	
S. Lucia	200	200	623	620	4,000lb.	5,599lb.	\$ Year 1918.
Gold Coast	687	687	755	—	12t	8.5t	
Bahamas	221	221	111\$	111\$	6t	2t	
Jamaica	4,128	4,128	12	12	30t	245lb.	
Trinidad	528	521	—	—	6t	792lb.	
Seychelles	—	—	48	—	—	—	
B. N. Borneo	215	—	522	—	—	—	

COTTON CAKE

	1913	1913	1921	1921	1913	1921
India ..	£ 48,157	£ 41,346	£ 22,607	£ 13,806	10,428t	1,932t

COTTON SEED

India ..	1,416,743*	1,391,510	1,026,592	987,776	28,4326t	92,221t	*Bombay, £1,298,039 in 1913
Sudan ..	20,771	19,350	65,999	—	4,629t	9,123t	
Nigeria ..	14,331	14,331	43,245	43,245	5,887t	8,579t	
Uganda ..	13,499	No figures	22,113	No figures	6,706t	4,866t	
Leeward Is. ..	5,772	—	2,183	—	596t	262t	
Grenada ..	2,779	2,053	2,142	—	506t	318t	
Cyprus ..	3,750	3,705	—	—	696t	—	
Tanganyika ..	—	—	474	457	—	1260lb.	
S. Lucia ..	30	—	44	—	5t	5t	
S. Vincent ..	3,064	88	146	—	524t	5t	
S. Africa ..	—	—	317	—	—	3.5t	
Nyasaland ..	974	575	7	—	269t	3,140lb.	
Jamaica ..	282	—	—	—	—	—	
Barbados ..	6	—	5	—	—	—	

3.517,744 + 713,734 = 4,231,478

COTTON SEED MEAL

Barbados ..	2,293	710	—	—	584t	—
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COTTON SEED OIL

India ..	347	342	97	—	2,507g	486g
S. Vincent ..	—	—	299	—	—	1,308g

COTTON TWIST AND YARN

India ..	6,554,873	8,921	7,714,568	4,187	48,204t	36,180t
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CROTON SEED

	1913	1913	1921	1921	1913	1921
	£	£	£	£		
Ceylon ..	2,648	505	3,093	542	41t	51t

CUMMIN

India ..	29,338	—	66,057	125	956t	902t
Malta ..	9,741	—	4,281	491	—	1,437t

CURRENTS

Australia ..	5,031	1,613	344,238	278,243	208t	4,854t
S. Africa ..	—	—	261	1	—	2t

3,063,162 + 155,219 = 3,218,381

DATES

Sudan ..	23,837	No figures	80,066	No figures	2,044t	3,417t
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EGGS

Canada ..	7,104	1,845	885,171	845,921	1,729*	78,958*
S. Africa ..	8,545	9	180,389	167,758	1,478*	20,831*
Australia ..	377	2	75,764	61,364	58*	9,706*
B. Malaya ..	—	—	27,216	—	—	—

*Numbers in thousands.

9,759,627 + 1,636,201 = 11,395,828

ESSENTIAL OILS (See also Names of Oils)

India*	113,992	14,161	320,937	130,462	72,140g	74,749g
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*For details see under the various oils

EUCALYPTUS OIL

Australia ..	40,338	21,241	24,247	5,000	—	7,329g
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FENNEL SEED

	1913	1913	1921	1921	1913	1921
India ..	£ 11,348	£ 3,689	£ 17,514	£ 1,540	762t	396t

FENUGREEK SEED

India ..	—	—	18,179	30	—	425t
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FISH (FRESH AND PRESERVED)

Canada*	3,267,340	789,294	6,666,073	1,526,480	—	—	* Including Fish Oils.
Newfoundland †	1,962,067	40,654	2,685,920	161,809	—	—	† Exclusive of Fish Oils, such as Cod Oil, Seal Oil, and Whale Oil, <i>q.v.</i>
S. Africa ..	111,116	51,401	232,202	13,533	—	—	‡ Balance of exports.
B. Malaya ..	—	—	455,653 †	—	—	—	
Australia ..	38,346	2	59,396	3	—	—	
N. Zealand ..	23,558	34	34,337	20	—	—	
Sudan ..	—	—	22,595 (£E.)	—	—	—	
B. N. Borneo ..	12,204	—	22,097	—	—	—	
Sarawak ..	16,300	—	17,626	—	—	—	
Seychelles ..	495	—	150	—	—	—	

FLAX

Australia ..	—	—	4,530*	4,530*	—	38t	3,032,360 + 91,847 = 3,124,207
Cyprus ..	925	—	1,250	—	120t	58t	* Australia imports large quantities of Flax.
India ..	273	—	233	233	2,589lb.	5,864lb.	
Canada ..	4,833	250	259,605	116,170	117t	1,334t	

FRUIT (DRIED)

Australia*	—	64	71,997	63,622	26t	721t	8,051,243 + 898,448 = 8,959,691
India† ..	157,205†	16,295†	192,614	8,279	13,336t†	9,489t	* Other than currants, raisins, and sultanas, <i>q.v.</i>
Canada ‡	—	—	6,326	—	—	19t	† Dried, salted, and preserved. ‡ 1911-12. ¶ See also apples.

FRUIT (PRESERVED IN LIQUID) *

	1913	1913	1921	1913	1921
Australia ..	£ 16,068	£ 196	£ 732,896	—	—
Canada ..	—	—	3,067	—	—

* See also Pineapples.

FURS*

Canada ..	1,044,113	520,851	2,446,029	733,298	—
Newfoundland	24,496	13,867	61,707	18,005	—

* See also Hides and Skins.

GAMBIER AND CUTCH

11,311 + 146,107 = 157,418

India* ..	62,162	34,741	56,209	19,835	2,945t	1,482t	* Mainly Cutch.
S. Settlements	10,921†	6,752	—	—	13,443† pikuls	—	
F. M. S. ..	18,117	—	—	—	18,195 "	—	
B. Malaya ..	—	—	74,167†	54,669	—	15,936† pikuls	
B. N. Borneo ..	25,958	No figures	46,454	No figures	—	—	† Balance of exports.
Sarawak ..	25,113	No figures	65,915	No figures	—	—	

GHEE

India ..	232,945	3,256	460,200	11,434	2,498t	2,403t	* Including Butter.
Tanganyika ..	—	—	58,137	—	—	748t	
Sudan* ..	10,068	—	5,229	—	129t	47t	

GINGELLY OIL

B. Malaya ..	—	—	3,610*	4	—	—	* Balance of exports.
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GINGER

802 + 72,892 = 73,694

	1913	1913	1921	1921	1913	1921
India ..	£	£	£	£	£	£
Jamaica ..	122,661	33,183	196,110	47,666	4,114t	3,723t
Sierra Leone ..	36,373	17,354	63,350	13,207	1,032t	618t
S. Africa ..	35,468	35,120	12,695	6,155	2,047t	550t
Ceylon ..	103	13	—	—	7t	—
Leeward Is. ..	35	3	80	—	1,75t	3t
	3	—	11	—	—	—

GINGER GRASS OIL

India ..	—	1,080	885	—	200g
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GLYCERINE

Australia*	24,487	16,935	2,794	—	249t	42t
S. Africa ..	39,025	4,842	5	—	636t	30lb.
Canada ..	—	—	7,940	—	—	125t
N. Zealand ..	2,789	2,789	3,266	1,104	79t	63t

136,680 = 1,382 = 138,060
* Includes Lanoline, etc., in 1913, but Glycerine alone in 1921.

GRAM (CHICK PEA)

India ..	415,104	69,130	107,824	—	69,596t	4,938t
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GRAPE FRUIT

Jamaica ..	28,355	8,441	17,715	7,047	—	—
Bahamas ..	2,032	20	857*	—	—	—
Trinidad ..	13	10	38*	—	—	—
B. Honduras ..	307	—	143†	—	—	—

28,127 + 13,520 = 41,647

* Year 1918.

† Year 1917.

GRAPES

1,568,046 + 242,830 = 1,810,879

	1913	1913	1921	1921	1913	1921
S. Africa ..	£	£	£	£	—	—
Cyprus ..	12,270	—	46,109	43,686	—	—
Channel Is. ..	1,487	—	3,225	170,302*	515t	106,972 boxes 338t 1,074t

* Board of Trade figures.

GROUND NUTS

154,861 + 1,444,198 = 1,799,059

India ..	3,254,246	5,564	6,261,969	2,196,799	277,907t	235,891t
Nigeria ..	174,716	77,692	1,111,822	402,879	19,288t	50,979t
Gambia ..	624,414	10,700	628,901	460,244	67,404t	59,175t
Tanganyika ..	—	—	79,536	25,750	—	3,168t
S. Vincent ..	1,623	—	4,474	—	6,181b	139t
Uganda ..	3,740	No figures	35	No figures	383t	2t
Nyasaland ..	12	12	41	41	1t	4t
Kenya ..	—	—	—	20*	—	3t
Sierra Leone ..	488	—	167	—	2,448b	427b
Gold Coast ..	21	1	—	—	3,062lb.	—

* Board of Trade figures.

GROUND NUT CAKE

India ..	261,971	130,650	616,855	446,414	62,026t	55,643t
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GROUND NUT OIL

India ..	30,013	—	15,884	—	288,100g	57,659g
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GUANO*

Seychelles ..	—	—	12,720	10,000	—	6,419t
Falkland Is. ..	34,343	No figures	—	—	—	—

*There is an annual production of 7,000 tons from the guano islands off S. Africa, but the whole is kept in the Union.

GUM, ARABIC

90,592 + 432,976 = 523,568

	1913	1913	1921	1921	1913	1921
Sudan*	£	£	£	£	£	£
India†	353,542	65,332	346,863	168,544†	14,069t	10,826t
Nigeria	62,485	7,800	6,435	3,581	2,239t	978t
	3,133	3,124	182	182	715t	4t

* All gums.

† Board of Trade figures.

‡ Bombay, £62,475 in 1913.

GUM, CHICLE

B. Honduras ..	59,227	—	68,625*	—	403t	389t*	* Year 1917.
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GUM, COPAL

B. Malaya ..	—	—	20,150*	12,610	—	7,289* pikuls	279,979 + 33,387 = 313,366
S. Settlements	49,405*	62,518	—	—	21,746* pikuls	—	
Sudan ..	9,150	140	—	—	702t	—	
Tanganyika ..	—	—	8,919	256	—	—	* Balance of exports.
Nigeria	—	—	285	285	—	133t	
						6t	

GUM, DAMAR

B. Malaya ..	—	—	55,014*	11,211	—	53,754* pikuls	
Sarawak ..	6,043	No figures	10,630	No figures	—	—	
B. N. Borneo ..	12,520	No figures	6,867	No figures	—	—	* Balance of exports.

GUM, KAURI

N. Zealand ..	549,106	187,547	367,197	134,502	8,780t	3,901t	
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GUTTA AND GUTTA PERCHA*

B. Malaya ..	—	—	472,144†	164,436	—	—	* See also Balata.
Sarawak ..	167,259	No figures	84,708	No figures	—	—	† Balance of exports.
Nigeria ..	4,424	3,555	2,312	430	74t	29t	
B. N. Borneo ..	1,288	No figures	2,145	No figures	—	—	

HEMP*

1,832,935 + 731,853 = 2,564,788

	1913	1913	1921	1921	1913	1921
India† ..	£ 682,319	£ 294,694	£ 393,576	£ 146,111	35,577t	12,810t
N. Zealand ..	721,924	538,324	293,775	103,119	28,092t	9,643t
Mauritius ..	85,356	70,365	10,023	3,456	2,860t	282t

* See also Sisal.

† Bengal, £376,050
Bombay, 243,396
Madras, 62,873

HIDES AND SKINS

5,393,996 + 5,501,619 = 10,895,615

India* ..	10,608,048	2,749,724	9,890,264	3,259,064	—	—
Australia† ..	5,541,352	2,137,053	3,136,810	1,333,778	—	—
S. Africa ..	2,017,863	1,913,227	1,226,876	675,387	—	—
N. Zealand ..	1,199,904	703,623	1,995,518	767,386	—	—
Canada† ..	1,455,168	77	946,441	3,574	—	—
Nigeria ..	197,213	112,539	128,727	78,167	—	—
Tanganyika ..	—	—	99,129	23,259	—	—
Ceylon ..	52,857	19,194	30,211	—	—	—
Sudan ..	49,223	10,963	27,832	No figures	—	—
Trinidad ..	7,928	948	26,747 ||	13,864 ||	—	—
Jamaica ..	37,575	8,438	26,043	1,603	—	—
Uganda ..	88,261	No figures	26,286	No figures	—	—
Falkland Is. ..	19,810	No figures	36,200§	No figures	—	—
Kenya ..	—	—	149,339	81 per cent.	—	—
B. Somaliland ..	—	—	134,011**	No figures	—	—
N. Rhodesia ..	4,419	No figures	7,511	No figures	—	—
S. Rhodesia ..	28,636	14,811	22,211	2,512	—	—
Newfoundland§§	3,416	20,081	3,348	929	—	—
S. W. Africa ..	—	—	19,112	No figures	—	—
Malta ..	17,595	5,620	11,291	448	—	—
Cyprus ..	14,110	—	6,224	32	—	—
B. N. Borneo ..	1,653	—	8,788	—	—	—
Fiji ..	1,996	—	3,946	—	—	—

* Bengal, £5,631,059
Madras, 2,493,784

1913

† Rabbit, £787,816
Fox, 22,562
Kangaroo 170,669
Opossum, 224,089
Wallaby 9,873
Sheep with wool, 1,346,582

1921-22

‡ Other than furs, q.v.

|| Year 1918.

§ Year 1920.

** Year 1919-20.

§§ Exclusive of Seal Skins, q.v.

HIDES AND SKINS—continued.

	1913	1913	1921	1921	1913	1921
Saravak	£ 1,135	£ —	£ —	£ —	—	—
Gold Coast	24,576	24,432	2,000	—	—	—
Gambia	18,717	18,196	1,558	667	—	—
Sierra Leone	4,249	821	934	934	—	—
Zanzibar	—	—	306	—	—	—
Leeward Is.	1,666	266	1,768	—	—	—
Bahamas	307	307	2,688	168	—	—
S. Lucia	1,099	—	419	—	—	—
B. Guiana	2,568	2,360	122	—	—	—
Mauritius	11,803	1,490	1,851	1,390	—	—
Grenada	611	104	244	—	—	—
Seychelles	—	—	—	—	—	—
Nyasaland	—	—	117	—	—	—
S. Vincent	404	—	116	106	—	—
B. Honduras	739	2	158	—	—	—
			974*	—	—	—

*Year 1917.

HONEY

N. Zealand	3,536	3,471	28,428	27,990	204,669g	384t	34,573 + 47,336 = 81,909
Jamaica	15,261	8,173	8,653	6,104	109,334g	396t	
Australia	4,094	2,830	4,448	51	127t	84t	
Canada	—	—	1,839	—	—	10t	
S. Lucia	495	485	473	416	23t	13t	* Year 1918.
Trinidad	26	19	1,208*	1,268*	1t	12t*	
Cyprus	240	—	172	—	8t	2t	
S. Vincent	41	31	44	29	312g	1t	
Leeward Is.	—	—	82	80	—	—	

HOPS

	1913	1913	1921	1921	1913	1921
N. Zealand ..	£ 22,680	£ 7,845	£ 19,142	£ 1,039	222t	105t
Canada ..	8,401	6,729	—	—	100t	—

ILLIPI NUT

S. Settlements	2,764*	750	—	—	3,069* pikuls	—	* Balance of exports
B. Malaya ..	—	—	1,747*	2,055	—	3,759* pikuls	

4,440 + 9,294 = 14,734

INDIGO

India ..	141,938	42,608	513,685	32,544	546t	618t
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314

IVORY

Sudan ..	90,057	65,786	32,410	24,796*	217,404lb.	84,086lb.	* Board of Trade figures.
Tanganyika ..	—	—	18,254	12,441	—	21,168lb.	
Kenya ..	—	—	—	6,210*	—	8,736lb.	
S. Africa ..	279	279	1,178	897	950lb.	2,933lb.	
S. Rhodesia ..	3,290	3,182	519	388	5,738lb.	1,104lb.	
N. Rhodesia ..	2,377	No figures	6,720	No figures	6,400lb.	13,338lb.	
Nigeria ..	7,137	6,833	1,323	1,323	27,440lb.	4,592lb.	
India ..	3,946	3,178	5,037	1,149	7,813lb.	5,415lb.	

192,594 + 56,917 = 249,421

JAMS AND JELLIES

Australia ..	29,219	81	164,045	65,514	907t	2,518t
S. Africa ..	6,960	385	36,457	11,350	194t	466t
S. Rhodesia ..	599	—	1,089	—	8t	9t
N. Zealand ..	1,847	24	3,905	2,078	47t	42t

JUTE

19,712 + 3,756,052 = 3,775,764

	1913	1913	1921	1921	1913	1921
	£	£	£	£		
India* ..	20,550,929	7,826,358	14,049,159	2,873,216	768,451t	375,628t

* Nearly all from Bengal.

JUTE (GUNNY BAGS AND GUNNY CLOTH)

India ..	18,749,763	971,183	27,527,940	2,005,773	—	—
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KAPOK

12,340 + 4,518 = 16,858

India ..	—	—	33,169	12,731	—	387t
Tanganyika ..	—	—	1,911	1,284	—	22t
Nigeria ..	1,097	1,097	—	—	20t	—
Ceylon ..	3,536	223	—	—	6t	—

KOLA NUTS

Gold Coast ..	144,704	368	463,598	81	3,136t	6,113t
Sierra Leone ..	328,003	65	313,644	77	1,865t	2,540t
Nigeria ..	1,459	352	3,135	818	48t	96t
Gambia ..	2,756	33	2,531	56	16t	15t
Jamaica ..	2,154	726	747	543	90t	19t
Grenada ..	129	129	145	139	8t	9t
S. Lucia ..	—	—	151	149	—	5t
Trinidad ..	36	4	22*	13*	—	—
Leeward Is. ..	7	7	42	42	—	—

* Year 1918.

LAC

India ..	1,310,525	400,554	7,915,814	1,785,986	16,958t	21,746t
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31,732 + 1,235,848 = 1,267,580

LEMONS*

Jamaica ..	130	114	—	—	—	—
Cyprus† ..	11,637	79	16,346	—	16,133,844	8,633,900

1,013,151 + 3,335 = 1,016,486

* Generally not classed separately, or with oranges. † Includes oranges.

LEMON GRASS OIL

	1913	1913	1921	1921	1913	1921
India ..	£ 67,955	£ 9,634	£ 91,942	£ 13,639	47,522g	43,737g
Uganda ..	44	—	—	—	1,169lb.	—

34,258 + 21,098 = 55,356

LIME, CITRATE OF

Leeward Is. ..	17,026	2,248	30,380	16,370	237t	342t
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LIME JUICE AND CORDIAL

Leeward Is.* ..	21,990	18,454	123,930	62,155	415,441g	562,980g
S. Lucia ..	2,490	2,490	9,831	8,214	7,968g	35,921g
Trinidad ..	—	—	7,354†	5,501†	—	29,419g†
Grenada ..	240	240	2,479	366	1,300g	9,325g
Jamaica ..	3,708	1,723	1,840	1,705	89,010g	28,353g
B. Guiana ..	—	—	601	232	—	4,175g

* Dominica, £15,082
 Montserrat 4,542
 Antigua 1,118
 S. Kitts 153
 Virgin Is. 195
 † Year 1918.

LIMES

Leeward Is. ..	560	46	27,182	34	—	21,389 barrels
S. Lucia ..	281	—	1,775	45	—	1,858 "
Jamaica ..	736	8	390	—	—	—
Grenada ..	—	—	45	45	—	—

LINSEED

7,656,954 + 935,854 = 8,592,808

India* ..	4,457,998	1,648,118	4,300,212	2,043,224	413,873t	173,503t
Canada ..	3,289,779	907,472	694,702	—	10,123,693b	1,343,591b
Cyprus ..	3,039	583	3,862	2,430	284t	284t
Australia ..	45	—	6	—	—	—
N. Zealand ..	5,087	18	—	—	472t	—

1913
 *Bengal, £2,092,596
 Bombay, 2,330,282

LINSEED CAKE

596,713 + 288,575 = 885,288

	1913	1913	1921	1921	1913	1921
India* ..	£ 542,837	£ 116,216	£ 164,281	£ 152,884	89,488t	11,120t
Canada† ..	214,940	101,901	132,767	59,208	34,564t	9,762t
Australia† ..	2,333	—	90,946	90,384	144t	1,443t

* Includes in 1913 Rape and Sesamum Cake.
† All Oil-cakes.

LINSEED OIL

India ..	17,493	977	17,612	1,587	102,300g	2,461t
Australia ..	—	—	1,897	4	—	6,087g

4,107 + 628 = 4,735

LOGWOOD EXTRACT

Jamaica ..	170,427	85,408	109,125	103,731	23,965 packages	6,951 packages
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85,330 + 299,698 = 385,028

MACE*

Grenada ..	18,939	16,429	12,915	3,201	107t	145t
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* See also Nutmeg.

MAIZE

	1913	1913	1921	1921	1913	1921
S. Africa	83,678	12,303	2,956,276	2,191,884	123,412t	444,235t
S. Rhodesia	31,248	503	223,410	187,665	4,216t	40,723t
India ..	13,969	9,777	15,708	14,857	2,880t	1,774t
Tanganyika ..	—	—	12,370	—	—	1,097t
Australia ..	1,710	3	9,023	9	187t	908t
N. Rhodesia ..	—	—	9,083	No figures	—	2,002t
Nigeria	40,349	26,225	1,114	12	16,841t	86t
Mauritius	—	—	400	—	—	—
Nyasaland	—	—	54	—	—	10t
B. Honduras	6,222	—	—	—	—	—
Canada	—	—	6,703	—	—	17,560b
B. Guiana	—	—	121	2	—	—
Fiji ..	1,729	—	—	—	—	—

13,979,779 + 5,892,173 = 19,871,952

MAIZE MEAL

	1913	1913	1921	1921	1921	1921	1921
		£	£	£	400	—	24,588 barrels
Canada ..	—	—	37,400	—	—	—	—

MALT

Canada ..	—	—	270,040	7,949	—	—	629,620b
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MANGROVE BARK

B. Malaya ..	—	—	6,782*	—	—	—	* Balance of exports.
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MANURES* (BONE, FISH, SULPHATE OF AMMONIA, ETC.)

India ..	629,870	77,659	1,167,741	161,773	105,110t	127,433t	* See also Guano, Phos- phates.
Canada ..	335,540	5,088	998,635	8,145	—	—	—
S. Africa ..	6,667	362	31,311	10	—	—	538t
S. W. Africa ..	—	—	3,481	—	—	—	—
Newfoundland	3,475	1,050	—	—	—	—	—

MAPLE SUGAR

Canada ..	20,865	774	372,451	1,099	515t	3,521t	—
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MEAT, POULTRY, AND GAME

98,111,989 + 34,790,858 = 103,317,334

(1) Bacon and Hams	1913	1913	1921	1921	1913	1921
Canada ..	1,134,703	1,125,961	6,298,481	6,240,276	17,733t	49,116t
Australia ..	73,982	20,958	223,065	9,944	824t	1,211t
S. Africa ..	—	—	42,467	33,705	—	255t
S. Rhodesia	—	—	10,634	—	—	52t
N. Zealand	4,991	11	5,795	87	51t	43t

MEAT, POULTRY, AND GAME—continued.

	1913	1913	1921	1921	1913	1921
(2) <i>Beef (Cold Storage)</i>	Australia .. N. Zealand* Canada† .. Australia ..	£ 2,652,275 367,548 27,022 675	£ 2,037,978 283,991 14,399 —	£ 1,867,927 1,798,653 34,658 2,584	£ 1,616,075 1,739,931 4,765 267	1921 55,432t 46,051t 753t 22t
(3) <i>Game (Cold Storage)</i>						
(4) <i>Mutton and Lamb (Cold Storage)</i>	N. Zealand Australia ..	3,994,496 2,896,532	3,988,372 2,712,652	9,256,627 2,139,615	9,110,182 1,393,179	1921 167,808* 40,944t
(5) <i>Pork (Cold Storage, etc.)</i>	Canada .. N. Zealand Australia ..	11,592 5,843 5,259	92 5,843 246	61,850 20,337 7,414	10,391 20,288 1,516	306t 242t 68t
(6) <i>Poultry (Cold Storage)</i>	Australia ..	10,979	1,106	50,205	1,903	100,734
(7) <i>Rabbits and Hares (Cold Storage)</i>	Australia .. N. Zealand	497,568 75,160	479,636 74,514	407,143 29,475	398,279 29,470	9,714,808 971,052
(8) <i>Others</i>	Canada .. Australia .. N. Zealand	— 99,509 5,806	— 86,192 5,571	251,018 126,042 33,481	79,833 107,599 31,599	49,377t 2,955t 748t
(9) <i>Preserved Meat</i>	Australia .. N. Zealand Canada .. Falkland Is.	1,083,639 101,398 5,343 —	820,301 38,489 5,157 —	348,389 273,591 44,087 23,127*	244,471 150,544 37,620 —	4,227t 2,965t 198t 4,794* cases
(10) <i>Sausage Casings</i>	N. Zealand Australia .. Canada .. S. Africa ..	93,251 123,753 — —	85,624 34,868 — —	447,873 313,975 115,535 9,572	56,980 30,887 27,736 710	1,185t — — —

* Including Pickled Beef and Veal.
† Pickled.

* 2,739,853 carcasses.
† 4,766,016 carcasses.

* Year 1920.

MILK AND CREAM (DRIED)

	1913	1913	1921	1921	1913	1921
N. Zealand	£	£	£	£	—	6,324t
Australia	19,850	10,998	964,727	960,971	564t	1,514t
			261,874	259,006		

MILK AND CREAM (PRESERVED AND CONDENSED)

Canada	..	—	1,637,587	728,944	—	21,940t
Australia	..	53,100	1,069,405	252,313	675t	14,872t
N. Zealand	..	—	147,604	28,173	—	1,352t

MILLET

33,058 + 8,011 = 41,069

Sudan	..	21,074	292,849*	—	3,939t	37,764t*
Tanganyika	..	—	93,597	192	—	7,873t
S. Africa	..	—	10,182	8,901	—	1,414t
Australia	..	336	3,612	—	10t	87t
S. Rhodesia	..	—	2,989	—	—	355t

* Including Maize in 1921.

MOHAIR

225,358 + 1,014,957 = 1,240,315

S. Africa	..	876,255	864,759	583,643	522,996	7,623t	7,521t
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MOLASCUIT

B. Guiana	..	22,551	21,734	5,317	5,300	6,860t	1,707t
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MOLASSES

621,260 + 7,874 = 629,134

	1913	1913	1921	1921	1913	1921
Barbados	£	£	£	£	9,086,000g	4,191,471g
Trinidad	436,610	7,574	403,927	154,824*	339,496g	897,168g*
Leeward Is.	4,243	—	169,363*	1,667	9,536 puncheons	2,244 puncheons
Fiji	35,761	2,445	13,099	—	10,447t	13,375t
S. Vincent	10,447	—	13,375	9,877	3,252g	117,157g
Tanganyika	170	—	9,878	623	—	265t
S. Lucia	—	—	9,325	—	6,135g	10,376g
S. Africa	155	—	5,325	111	5,218t	16t
Jamaica	15,354	15,258	798	—	—	—
Mauritius	—	—	628	—	3,140t	—
B. Guiana	6,131	—	—	—	118,699g	204g
	4,990	—	7	—		

* Year 1918.

MOWRA SEEDS

India ..	363,634	—	15,449	12	33,299t	910t
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MUSTARD SEED

India ..	70,724	8,903	22,961	249	5,104t	752t
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MUSTARD SEED OIL AND RAPE SEED OIL

India ..	48,624	1,162	83,930	1,605	407,178g	310,295g
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MYROBALANS

0 + 133,230 = 133,230

India ..	379,623	142,683	586,659	171,209	61,815t	61,946t
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NIGER SEED

India ..	42,926	4,399	9,455	8,119	4,107t	354t
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NUTMEG*

	1913	1913	1921	1921	1913	1921
Grenada	£	£	£	£	727t	901t
B. Malaya	25,205	22,894	34,007	10,301	—	—
Ceylon	—	—	17,607†	16,620	—	—
S. Vincent	175	33	4,191	3,415	5.5t	9t
S. Lucia	94	80	132	78	3t	5.5t
Trinidad	—	—	86	11	—	2t
B. Guiana	85	36	84†	43†	2t	1.5t
India ..	—	—	77	77	—	3c
Seychelles	17	—	11	—	955lb.	114lb.

* See also Mace.

† Balance of exports.

‡ Year 1918.

2,264,285 + 2,138,535 = 4,402,820

OATS

	1913	1913	1921	1921	1913	1921
Canada	1,015,590	718,449	2,832,406	1,324,707	10,478,554b	14,321,048b
N. Zealand	29,252	329	84,434	82,152	239,268b	172,589 centals
Australia	13,425	—	49,980	4,906	1,904t	5,817t
S. Africa	12,868	—	30,904	6,734	1,923t	4,004t
India ..	3,391	—	10,134	—	469t	515t
Cyprus	3,704	—	28	—	—	—

175,251 + 208,775 = 384,026

OATMEAL

	1913	1913	1921	1921	1913	1921
Canada	167,416	166,083	468,733	419,219	188,987 barrels	19,863t
Canada*	403,135	276,066	170,851	160,649	—	—
Australia†	3,048	—	5,509	42	299t	171t

* Prepared Oatmeal and other prepared cereal foods.

† Including Wheatmeal.

512,859 + 1,016 = 513,875

OLIVE OIL

	1913	1913	1921	1921	1913	1921
Australia	111	10	70	—	164g	89g
Cyprus	838	—	9	—	19t	2c

OPIUM*

51,202 + 0 = 51,202

	1913	1913	1921	1921	1913	1921
India ..	£ 2,280,031	£ 18,443	£ 2,054,227	£ —	843t	447t
Sarawak ..	23,285	—	55,535	—	—	—
B. N. Borneo	300	—	—	—	—	—

* See also Poppy Seeds.

ORANGES

7,112,481 + 841,567 = 7,954,048

	1913	1913	1921	1921	1913	1921
S. Africa	11,530	—	198,410	196,544	—	231,397 boxes
Australia*	22,222	256	79,754	7,443	2,845,300	5,949,200
Jamaica	58,967	24,082	39,848	37,463	45,863,000	106,130 boxes
Cyprus†	11,637	79	16,346	—	16,133,844	8,633,904
S. Rhodesia	—	—	11,773	11,086	—	18,575 boxes
Leeward Is.	1,087	426	1,601	134	—	—
Malta ..	—	—	941	916	—	202,128
Trinidad	1,157	513	726†	—	472,386	483,879†
Bahamas	599	26	111†	—	622,257	113,242†

* All citrus fruits.

† Includes Lemons.

‡ Year 1918.

ORGANUM OIL

Cyprus	—	—	1,280	1,280	—	23c
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OSTRICH FEATHERS

21,090 + 301,143 = 322,233

S. Africa	2,953,587	2,391,809	461,533	276,520	1,623,307lb	296,711lb
Sudan ..	4,583	—	—	—	10,876lb	—
S. Rhodesia ..	236	—	—	—	127lb	—

PALMA ROSA OIL

India ..	—	—	10,502	5,380	—	1,277g
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PALM KERNEL CAKE

Nigeria	31,484	—	—	—	5,411t	—
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PALM KERNEL OIL

151,427 + 29,970 = 181,397

	1913	1913	1921	1921	1913	1921
Nigeria ..	£ 129,442	£ 128,979	£ 15,577	£ 15,577	3,857t	374t

PALM KERNELS

818,001 + 4,254,964 = 5,072,965

Nigeria ..	3,109,818	2,831,688	2,797,453	174,718t	153,354t
Sierra Leone ..	920,943	685,069	684,422	49,201t	40,408t
Gold Coast ..	159,127	3,820	28,790	9,743t	1,051t
Gambia ..	9,026	4,478	4,307	536t	302t

PALM OIL

319,322 + 1,673,451 = 1,992,773

Nigeria ..	1,854,384	1,552,743	1,655,914	1,482,409	83,088t	52,771t
Gold Coast ..	65,051	44,740	7,717	7,274	—	67,447g
Sierra Leone ..	56,659	46,209	7,708	6,602	617,088g	191t
Gambia ..	17	16	49	—	—	—

PAPER

6,342,618 + 1,244,334 = 7,386,979

Canada ..	1,265,555	117,000	18,420,661*	769,085	—	—
Newfoundland ..	359,097	359,097	617,652	617,652	40,977t	34,512t
India ..	—	—	13,764	274	—	—

* £1,185,626 worth sent to Australia.

PARAFFIN WAX

India ..	448,736	129,498	1,277,024	203,029	15,157t	28,141t
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PEARL SHELL

Australia ..	382,722	325,484	317,623	69,656	2,065t	1,945t
Fiji ..	1,255	880	20	—	20t	1026lb.

PEPPER

122,454 + 378,067 = 500,521

	1913	1913	1921	1921	1913	1921
India ..	£ 289,943	32,399	£ 310,350	6,196t	5,289t	
B. Malaya ..	84,267*	115,235	131,185*	217,902	20,278* pikuls	
S. Settlements ..	148,885	No figures	91,946	No figures		* Balance of exports.
Sarawak ..	3,737	2,724	2,889	1,749	85t	
Ceylon ..	565	—	2,163	1,424	25t	
Sierra Leone ..	1,000	—	1,367	—	30t	
B. N. Borneo						

PETROLEUM

45,640,856 + 1,747,427 = 47,388,285

India* ..	142,732	93,014	2,055,888	1,490,220	22,714,609g	* Nearly all from Burma.
Sarawak ..	8,585	No figures	848,306	No figures	—	† Year 1918.
Trinidad ..	75,020	6,684	426,678†	377,276†	42,874,7538†	‡ Gasoline, year 1918.
" ..	—	—	141,968†	113,587†	2,741,6228†	
Canada ..	—	—	101,606	23,229	—	

PHOSPHATES

Christmas Is. ..	383,346	No figures	170,514	No figures	159,005t	85,505t	*The deposits are worked by the Pacific Phosphate Co., but no official figures of export are issued by the Administration.
Nauru* ..	—	—	—	—	—	—	
Ocean Island ..	—	—	—	—	—	—	

PIASAVA

94,325 + 241,551 = 118,876

Sierra Leone ..	12,280	4,703	13,068	11,448	839t	741t
Nigeria ..	2,806	2,792	4,826	4,826	227t	279t

PIMENTO

Jamaica ..	88,148	5,019	44,272	1,601	6,780t	4,024t
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PINEAPPLES*

255,686 + 874,069 = 1,129,755

	1913	1913	1921	1921	1913	1921
B. Malaya ..	£ —	£ —	£ 688,894	£ 632,395	—	662,327 cases
S. Settlements ..	344,374†	242,627	—	—	—	—
Bahamas ..	6,544	4	7,454†	—	743,421† cases	22,315 cases
Australia ..	3,980	2	6,199	6,189	7,222 cases	644,200
S. Africa ..	1,687	—	7,789	7,560	656,300	18,793 boxes
Leeward Is. ..	267	171	48	—	—	—
Jamaica ..	112	21	19	12	6,732	—

* Including tinned Pine-apples.

† Balance of exports.

‡ Year 1916.

POMEGRANATES

Cyprus ..	16,971	—	27,081	—	4,994†	3,359†
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POONAC*

India ..	26,965	626	55,053	100	4,208†	3,346†
Ceylon..	72,851	1,066	22,448	17,740	11,834†	—

* Coconut Cake.

POPPY SEED*

India ..	310,589	1	207,189	1,613	18,029†	6,482†
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* See also Opium.

RAISINS AND SULTANAS

Australia ..	25,262	12,690	550,206	420,519	850†	5,493†
S. Africa ..	—	—	179,599	151,514	—	3,118†
Cyprus ..	39,002	45	45,517	2,310	3,972†	1,770†

2,945,885 + 725,592 = 3,671,447

RAPE CAKE

India ..	—	—	486,963*	5,412*	—	38,786†*
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* Includes Sesamum Cake.

RAPE SEED

	1913	1913	1921	1921	1913	1921
	£	£	£	£		
India* ..	2,851,711	179,830	3,167,741	698,134	249,005t	133,697t
						*1913 { Sind, £2,165,092 Bombay, 609767

RATTANS

B. Malaya	..	—	415,532*	25,298	—	—
Sarawak	..	16,710	8,000	No figures	—	—
India ..	..	3,160	2,193	462	—	—
B. N. Borneo ..	..	11,576	—	—	—	—
						* Balance of exports.

107,610 + 115,150 = 222,760

RICE

India* ..	..	17,537,617	1,129,677	1,972,240	2,450,349t	1,405,474t
B. Guiana	..	101,908	10	—	7,709t	2,027t
Tanganyika	..	—	—	—	—	1,150t
Sarawak	..	27,710	—	—	—	—
B. N. Borneo ..	..	1,602	—	—	—	—
Sierra Leone ..	..	3,662	—	—	—	—
Ceylon ..	..	—	—	—	21,035b	1,540b
Trinidad	..	214	—	—	—	35t
Uganda	..	50	—	—	2,160lb.	—
					4,473lb.	—
						*Burma £11,842,849 Bengal, 3,304,631 Madras 1,618,987 Sind, 487,007 Bombay, 283,533 Bihar-Orissa 198,590

2,916,150 + 3,486,002 = 6,402,152

RUBBER

B. Malaya	..	—	11,208,717*	3,080,383	—	150,997t*
S. Settlements	..	1,144,060*	1,893,827	—	67,384* pikuls	—
F. M. S.	..	5,666,034	No figures	—	23,465t	—
Ceylon ..	..	4,084,617	2,324,977	3,875,204	11,324t	39,141t
India ..	..	524,486	326,113	475,207	1,163t	4,917t
Sarawak	..	67,016	No figures	No figures	—	—
						* Balance of exports.

1,742,590 + 7,496,498 = 9,239,088

RUBBER—continued

	1913	1913	1921	1921	1913	1921
	£	£	£	£		
Tanganyika ..	87,914	87,239	13,770	8,461	—	149t
Gold Coast ..	4,041	No figures	6,744	5,591	544t	45t
Uganda ..	—	—	4,441	No figures	13t	33t
Fiji ..	—	—	4,053	3,455	—	30t
Nyasaland ..	19,585	13,159	3,264	3,264	50t	40t
Trinidad ..	1,291	1,291	4,939*	2,980*	3t	17t*
B. Guiana ..	164	160	189	189	1,340lb.	8,946lb.
Seychelles ..	278	278	22	7	3,524lb.	572lb.
Grenada ..	—	—	10	10	—	851lb.
S. Africa ..	3,493	3,453	—	—	61t	—
B. Honduras ..	1,255	107	—	—	6t	—
Gambia ..	1,026	1,026	—	—	6t	—
Sierra Leone ..	1,292	1,127	—	—	6t	—
Nigeria ..	1,214	—	—	—	12t	—
Zanzibar ..	270	135	—	—	1t	—
N. Rhodesia ..	120	—	—	—	1,457lb.	—
B. N. Borneo ..	46,423	No figures	—	—	—	—

* Year 1918.

22
80

11,142 + 988,122 = 999,264

RUM

B. Guiana ..	195,975	176,873	349,601	314,442	3,260,956g	2,228,161g
Jamaica ..	101,328	30,607	191,754	159,066	953,677g	958,788g
Trinidad ..	10,657	10,446	29,590*	28,117*	102,322g	145,058g*
Barbados ..	598	80	15,520	—	7,963g	24,867g
Mauritius ..	—	—	2,585	1,266	—	58,189 litres
Leeward Is. ..	1,506	1,275	—	—	18,414g	—
S. Lucia ..	2,032	1,065	—	—	17,760g	—
B. Honduras ..	1,913	—	676†	—	14,818g	5,943g†

* Year 1918.

† Year 1917.

RYE*

441,746 + 305,126 = 746,872

	1913	1913	1921	1921	1913	1921
Canada ..	£ 2,981	£ 2,861	£ 1,067,156	£ 466,259	26,160b	3,201,430b†
S. Africa ..	—	—	20,295	—	—	2,880t
N. Zealand ..	728	—	—	—	4,229b	—

* Including Rye Flour.
† And 10,833 barrels of Flour.

SAGO

11,342 + 278,112 = 289,454

S. Settlements	132,655*	162,967	—	—	138,704* pikuls	—
B. Malaya ..	—	—	101,673*	144,565	—	—
Sarawak ..	113,401	No figures	161,723	No figures	78,783* pikuls	—
B. N. Borneo ..	8,500	No figures	298,004	No figures	—	—

* Balance of exports.

SALTPETRE

62,146 + 114,432 = 176,578

India ..	205,598	38,844	413,150	142,546	13,403t	11,747t
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SANDALWOOD

Australia ..	57,947	41,476	75,823	267	6,683t	4,481t
India ..	128,626	28,326	71,296	1,274	—	379t

SANDALWOOD OIL

India ..	—	—	147,595	86,845	—	6,654g
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SEAL OIL

Newfoundland	81,812	60,449	35,201	15,267	4,178t	1,730t
Falkland Is. ..	9,840	No figures	—	—	4,050 barrels	—

SEALSKINS

	1913	1913	1921	1921	1913	1921
Newfoundland	£	£	£	£	1913	1921
Canada ..	70,159	12,794	41,130	26,661	—	—
S. Africa ..	5,608	No figures	6,676	175	—	—
	5,822	5,774	12,111	12,111	—	—

298 + 34,210 = 34,508

SENNA

India ..	26,425	13,168	97,054	28,467	1,322t	2,086t
Sudan ..	7,397	241	9,981	2,860*	619t	191t

* Board of Trade figures.

SESAME

India* ..	1,796,841	4	948,667	2,187	112,209t	21,098t
Sudan ..	103,425	4	259,125	No figures	6,145t	12,373t
Tanganyika ..	—	—	26,493	22,544	—	895t
Uganda ..	10,449	No figures	18,907	No figures	896t	1,003t
Nyasaland ..	5,064	1,083	—	—	—	—
Cyprus ..	2,144	—	6,851	—	108t	245t

*Bombay, £1,475,140 in 1913.

SESAME OIL

India ..	28,599	510	27,370	76	208,053g	104,280g
Tanganyika ..	—	—	2,445	73	—	8,406g
Sudan ..	—	—	1,743	No figures	—	32t

SHEA BUTTER

Nigeria ..	4,044	148	5,402	9,121	114t	265t
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SHEA NUTS

Nigeria ..	70,427	36,244	54,831	13,245	9,407t	5,005t
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SILK

609,441 + 35,490 = 644,931

	1913	1913	1921	1921	1913	1921
India ..	£	£	£	£	537t	517t
Cyprus ..	29,002	25,631	262,854	106,030	—	29t
			12,127	—		

SISAL*

	1913	1913	1921	1921	1913	1921	* See also Hemp. † Year 1918. ‡ Board of Trade figures.
Tanganyika ..	—	—	364,448	243,567	—	11,084t	
Bahamas ..	69,706	—	128,564†	—	3,225t	2,607†	
Jamaica ..	1,128	—	760	—	20t	—	
Fiji ..	210	—	—	—	8t	—	
Kenya ..	—	—	No figures	357,345†	—	8,823†	

SUGAR

24,419,874 + 10,918,942 = 35,338,816

	1913	1913	1921	1921	1913	1921	* Year 1918.
Mauritius ..	3,070,069	509,625	15,459,230	13,477,175	184,418t	225,131t	
S. Africa ..	3,113	—	2,069,764	—	159t	62,749t	
Fiji ..	1,041,926	—	2,053,405	—	94,709t	72,624t	
B. Guiana ..	1,058,563	250,873	2,019,978	1,056,035	87,414t	108,270t	
Trinidad ..	418,107	267,341	811,068*	673,714*	37,607t	35,104t*	
Leeward Is. ..	189,726	33,102	535,304	443,017	20,994t	22,146t	
Jamaica ..	52,171	15,920	519,890	210,077	4,891t	26,835t	
Barbados ..	90,671	21,087	515,187	97,061	10,539t	25,897t	
India ..	91,649	30,747	248,669	44,414	9,596t	6,201t	
S. Lucia ..	65,512	58,298	80,820	26,067	4,652t	3,238t	
S. Rhodesia ..	—	—	5,904	—	—	95t	
Tanganyika ..	—	—	5,749	—	—	161t	
B. Honduras ..	4,977	—	—	—	58t	—	
Uganda ..	193	—	4,341	—	11t	15t	
Ceylon ..	535	1	—	—	133t	—	
F. M. S. ..	633	—	—	—	—	—	

TALLOW

1,877,462 + 1,728,614 = 3,606,076

	1913	1913	1921	1921	1913	1921
Australia ..	2,172,343	£	1,500,236	£	71,884*	44,744†
N. Zealand ..	581,545		580,973		20,306†	27,712†
India ..	17,389		35		497†	437†
Canada ..	26,685		11,139		891†	948†
Falkland Is. ..	4,516		No figures	No figures	222†	239†
S. Africa ..	1,946		97		57†	6†

* And 111,346g.

† And 40,072g.

‡ Year 1920.

TAPIOCA

514,464 + 222,239 = 736,703

	1913	No figures	426,166*	101,928	49,104 pikuls	579,759* pikuls
F. M. S. ..	19,032					
B. Malaya ..						

* Balance of exports.

TEA

1,577,575 + 21,534,244 = 23,111,819

	1913	1913	1921	1921	1913	1921
India* ..	9,983,372		7,232,049		129,229†	140,124†
Ceylon ..	5,852,505		3,411,958		84,495†	71,162†
Nyasaland ..	1,693		1,690		30†	93†
S. Africa ..	274		151		4'4†	9'5†

* Bengal, 48,905,946
Madras, - 974,423
Bombay, 101,667

TEA SEED

	1913	1913	1921	1921	1913	1921
India ..	55,002		7,727		392†	19†

TURMERIC

	1913	1913	1921	1921	1913	1921
India ..	87,450		7,262		5,751†	2,409†

THYMOL*

	1913	1913	1921	1921	1913	1921
India ..	£ —	£ —	£ 1,249	£ 700	—	28og
* See also Ajwan Seeds.						
TIMBER AND WOOD PRODUCTS						
						25,575,530 + 4,446,432 = 30,021,962
Canada	9,936,266	2,249,090	38,303,392	6,545,670	—	—
Sarawak	4,143	No figures	1,875,820	No figures	—	—
Australia	1,014,973	143,219	1,147,630	110,426	—	—
India ..	571,636*	307,218	637,824	214,782	—	—
N. Zealand	319,342	8,657	505,942	1,244	—	—
B. Honduras	147,422	23,888	208,505†	31,823†	—	—
Gold Coast	366,093	232,781	206,511	47,035	—	—
Nigeria	106,048	73,894	118,905	111,120	—	—
Newfoundland †	95,859	74,535	105,471	103,745	—	—
B. Guiana	44,566	26,320	38,742	16,650	—	—
Jamaica	122,780 ||	20,145	36,998	5,982	—	—
B. N. Borneo	75,495	—	25,093	—	—	—
B. Malaya	—	—	10,357§	—	—	—
S. Africa	3,329	2,004	7,038	2,269	—	—
Ceylon	24,589**	6,560	6,006	135	—	—
Tanganyika	—	—	3,713	—	—	—
S. Lucia	5,869	871	3,181	470	—	—
Fiji ..	1,069	—	1,704	—	—	—
Grenada	471	—	1,704	—	—	—
Bahamas	—	—	1,561††	—	—	—
Trinidad	40,623††	2,694	1,018††	—	—	—
Uganda	766	—	16	—	—	—
S. Rhodesia	3,661	—	—	—	—	—
S. Vincent	221	—	—	—	—	—
Leeward Is.	690	57	—	—	—	—

* Teak, £524,317 in 1913.

† Year 1917.

‡ Including Pulp.

|| Logwood, £106,423.

§ Balance of exports.

** Satinwood, £17,523.

†† Year 1918.

‡‡ Cedar Logs, £40,599.

TOBACCO

22,107,760 + 727,497 = 22,835,257

	1913	1913	1921	1921	1913	1921
India ..	£ 319,566	£ 12,800	£ 713,079	£ 92,913	13,403t	10,816t
B. N. Borneo ..	240,256	No figures	313,426	No figures	—	—
Nyasaland ..	60,201	56,535	297,091	296,717	1,074t	2,207t
S. Rhodesia ..	58,778	1,364	196,702	—	511t	1,073t
S. Africa ..	15,579	2,565	87,879	1,165	100t	285t
Jamaica* ..	37,498	4,731	79,708	4,951	52t	55t
Ceylon ..	57,265	—	61,831	—	1,908t	1,079t
N. Rhodesia ..	2,433	No figures	47,856	No figures	19t	507t
Canada ..	19,124	766	26,091	1,448	41t	89t
Tanganyika ..	—	—	7,000	1,012	—	247t
Uganda ..	102	—	—	—	2c	—
Zanzibar ..	1,439	—	1,339	—	47t	47t
Cyprus ..	—	—	669	—	—	7t
Sarawak ..	184	—	300	—	—	—

* Cigars valued at £79,242 in 1921.

VANILLA

Mauritius ..	3,533	2,148	1,815	1,550	3,898lb.	2,191lb.
Ceylon ..	970	481	628	300	—	—
Seychelles ..	6,789	5,659	834	401	13,457lb.	2,985lb.
Leeward Is. ..	33	29	1,222	1,185	—	—
S. Lucia ..	94	10	32	—	691lb.	912lb.
S. Vincent ..	14	14	18	18	35lb.	66lb.

WHALE OIL

Falkland Is.* ..	1,206,396	No figures	1,559,469	No figures	70,686t	383,816 barrels
S. Africa ..	122,692	92,415	25,191	24,253	2,177,537g	244,799g
Canada ..	—	—	19,091	—	—	78,542g
N. Zealand ..	18,481	1,603	7,505	4	247,831g	54,130g
Newfoundland ..	19,880	19,875	60	60	966t	5t

460,770 + 303,640 = 764,410

* South Georgia, etc.

WHEAT (AND WHEAT FLOUR)

37,282,212 + 33,323,856 = 70,606,068

	1913	1913	1921	1921	1913	1921
Canada	19,915,884	17,484,127	62,190,428	14,697,959	93,166,009b*	129,215,157b
Canada†	—	—	13,304,098	5,779,238	—	6,017,032 barrels
Australia	9,851,144	5,382,727	34,164,036	13,140,114	30,186,883 centals	67,163,006 centals
India†	9,589,639	5,726,072	3,338,467	546,945	1,281,617t	145,229t
S. Africa	59,583	—	49,347	4	11,520,248lb	3,197,979lb.
Cyprus	21,967	—	11,479	—	193,637lb.	68,633lb.
N. Zealand	11,816	10,965	243	—	62,338b	—

*And 4,478,043 barrels of Flour.
†Flour.

1913
*Sind, 66,920,019
Bombay, 2,130,961

WINE

5,077,769 + 240,206 = 5,317,975

	1913	1913	1921	1921	1913	1921
Australia	99,293	72,961	149,190	9,394	696,748g	595,896g
S. Africa	11,515	563	93,142	7,795	—	383,726g
Cyprus	43,060	8,711	82,299	138	1,129,949g	1,098,575g

WOOL

3,997,569 + 37,553,316 = 41,550,885

	1913	1913	1921	1921	1913	1921
Australia	26,276,962	9,452,767	51,552,608	23,013,282	251,929t	365,747t
N. Zealand	8,057,620	7,271,066	5,221,479	4,740,915	83,024t	70,059t
S. Africa	6,079,298	3,005,326	8,236,835	3,589,138	79,005t	102,866t
India*	1,669,646	1,621,111	2,544,609	2,493,116	21,733t	14,386t
Canada	38,700	24,617	433,651	10,971	435t	3,254t
Falkland Is.	158,443	No figures	269,170†	No figures	2,241t	2,014t†
Cyprus	12,181	101	5,545	1,122	235t	111t
S. W. Africa	—	—	4,041	—	—	82t
Jamaica	571	571	315	203	35t	12t
S. Rhodesia	917	411	162	—	—	—
Malta	177	—	140	—	—	—
S. Vincent	46	46	—	—	—	—
Fiji	861	—	—	—	—	—
Grenada	48	—	—	—	—	—

1913
*Bombay, 807,331
Sind, 861,363

†Year 1920.

MINERALS

ALUNITE

	1913	1913	1921	1921	1913	1921
Australia ..	£ 8,940	£ 8,940	£ 7,090	£ 7,090	2,235t	£ 1,535t

ALUMINIUM*

206,154 + 1,265 = 207,419

Canada ..	326,257	91,830	929,364	231,259	7,811t	7,002t
Australia ..	—	—	70	—	—	—

* See also Bauxite.

ANTIMONY

45,475 + 288 = 45,763

Australia ..	44,883	44,347	17,986	15,381	—	—
Nigeria ..	—	—	20	10	—	—

ASBESTOS

161,521 + 908,808 = 1,070,329

Canada ..	497,354	42,290	2,451,158	267,471	91,820t	154,152t
S. Rhodesia ..	2,496	2,496	431,028	416,253	222t	16,413t
S. Africa ..	15,143	5,023	105,434	55,115	1,014t	4,421t
Cyprus ..	9,704	4	30,960	13	1,169t	897t

BAUXITE*

19,603 + 5,336 = 24,939

B. Guiana ..	57,975	—	—	—	12,384t	—
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* See also Aluminium

BISMUTH

13,637 + 23,434 = 37,071

Australia ..	4,475	3,549	869	869	—	—
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CHROME IRON ORE

19,441 + 65,719 = 85,160

	1913	1913	1921	1921	1913	1921
S. Rhodesia ..	£ 141,494	£ 7,030	£ 81,262	£ 18,793	62,899t	35,586t
India ..	9,205	4,109	76,923	7,050	3,598t	24,474t
Canada*	238,029	31,150	30,354	—	153,384t	8,246t

*Chromic Iron Ores and other ores.

COAL

Canada ..	1,111,019	24,061	3,300,295	188,259	2,055,993t	2,277,302t
Australia ..	1,121,505	43	1,099,899	10	2,098,505t	1,038,767t
S. Africa ..	1,389,698	86	1,949,014	—	2,307,782t	1,795,093t
India ..	461,424	75	160,299	39	723,641t	114,732t
N. Zealand ..	204,900	143,413	109,510	60,970	184,900t	53,183t
Nigeria ..	—	—	104,452	57,957	—	29,494t
B. N. Borneo ..	19,516*	—	63,104	—	—	—
S. Rhodesia ..	11,569	—	60,601	—	25,959t	102,275t

* Year 1911.

COBALT

Canada ..	—	—	79,319	22,409	—	68t
Australia ..	—	—	40,976	40,976	—	594t

COPPER

6,259,607 + 1,426,651 = 7,686,258

Canada ..	1,982,308	80,770	2,534,252	252,789	—	—
Australia ..	2,977,940	887,972	2,440,622	1,013,564	—	—
S. Rhodesia ..	1,649	—	401,947	—	—	—
S. W. Africa ..	—	—	403,798	—	—	—
India ..	27,408	136	21,070	645	—	—
S. Africa ..	449,355	449,255	11,055	6,219	—	—
N. Rhodesia ..	51,765	No figures	2,400	No figures	—	—
Newfoundland ..	13,341	13,341	—	—	—	—

CORUNDUM

3,189 + 2,725 = 5,914

	1913	1913	1921	1921	1913	1921
Canada ..	£ 39,203	£ —	£ 19,343	£ —	1,813t	761t

DIAMONDS

S. Africa ..	12,016,725	11,286,083	1,355,487	1,135,488	—	—
S. W. Africa ..	—	—	810,739	—	—	—
B. Guiana ..	16,463	16,415	328,739	264,533	—	—
S. Rhodesia ..	4,328	3,238	297	297	—	—

GOLD

S. Africa ..	37,589,399	37,589,399	34,453,586	34,453,586	—	—
Australia ..	1,452,325*	763,216	2,819*	2,614	—	—
S. Rhodesia ..	2,887,201	2,887,201	2,298,596	2,298,596	—	—
Gold Coast ..	1,626,003	1,626,003	855,097	855,097	—	—
Canada ..	2,245,314	11,407	607,756	39	—	—
N. Zealand ..	1,429,969	344,547	605,629	1,285	—	—
Sarawak ..	119,700	—	62,132	—	—	—
B. Guiana ..	275,866	275,866	44,998	10,013	—	—
F. M. S. ..	44,509	—	—	—	—	—
Sudan ..	30,885	2,266	—	—	—	—
N. Rhodesia ..	—	—	6,015	—	—	—
Nigeria ..	—	—	2,272	2,272	—	—

* Exports only. Value of production in 1920 was £5,308,092.

GYPSUM

Canada ..	87,897	—	85,410	—	379,393t	253,098t
Cyprus ..	—	—	9,827	—	—	8,881t

14,595 + 6 = 14,601

IRON

3,554,963 + 14,947 = 3,569,910

	1913	1913	1921	1921	1913	1921
India ..	£	£	£	£	—	—
Newfoundland	284,456	1,990	535,558	—	—	—
Australia ..	274,075	25,485	108,737	1,661	—	—
Canada*	1,191	—	46,071	50	—	—
S. Africa ..	66,000	372	18,639	—	—	—
	1,620	83	—	—	—	—

* See also Chromium.

LEAD

2,281,508 + 757,524 = 3,039,032

	1913	1913	1921	1921	1913	1921
Australia ..	1,847,715	1,232,039	1,730,341	1,306,989	—	—
India ..	58,658	36,982	1,118,053	240,911	—	—
N. Rhodesia ..	—	—	304,819	No figures	—	—
Canada ..	1,688	—	105,131	—	—	—
Ceylon*	603,152	113,015	75,791	3,632	—	—
S. W. Africa ..	—	—	2,912	—	—	—
S. Africa ..	2,049	—	40	—	—	—
Canada*	15,809	—	24,094	378	—	—

* Graphite or Plumbago.

MOLYBDENUM

	1913	1913	1921	1921	1913	1921
Australia ..	19,475	8,762	350	350	134t	3t
Canada ..	—	—	15	—	—	10

MANGANESE

159,225 + 954,369 = 1,113,594

	1913	1913	1921	1921	1913	1921
India ..	808,763	281,740	1,251,187	179,820	718,049t	519,497t
Gold Coast ..	—	—	12,395	2,342	—	7,195t
Canada ..	60	—	3,933	—	8t	637t
Australia ..	—	—	135	—	—	15t

MICA

115,876 + 246,960 = 362,836

	1913	1913	1913	1921	1921	1921	1913	1921
India ..	£	£	£	£	£	£	£	£
Canada ..	302,564	182,789	633,406	338,738	2,699t	1,356t	2,845t	2t
Ceylon ..	63,889	6,930	132,043	9,010	405t	10t	—	—
S. Africa ..	1,475	1,444	8,300	8,300	—	—	—	—
Nyasaland ..	2,388	1,343	—	—	63t	—	—	—
	2,026	2,026	—	—	—	—	—	—

MONAZITE

0 + 13,204 = 13,204

India ..	—	—	63,452	7,426	—	940t	—	—
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NICKEL

18,000 + 359,014 = 377,014

Canada ..	1,009,039	143,628	1,881,058	388,496	21,503t	23,509t	—	—
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PLATINUM

111,047 + 7,060 = 118,107

Australia ..	—	—	35,988	8,342	—	1,907 oz.	—	—
Canada ..	704	—	10,493	—	89 oz.	540 oz.	—	—

SCHEELITE

Australia ..	4,457	—	1,975	—	44t	52t	—	—
N. Zealand ..	22,933	3,046	—	—	221t	—	—	—

SILVER

Canada ..	4,040,511	2,063,631	2,225,486	880,370	—	—	—	—
Australia ..	2,780,981	364,758	960,574	34,441	—	—	—	—
N. Zealand ..	98,107	55,350	64,622	15,569	—	—	—	—
S. Rhodesia ..	—	—	10,112	10,112	—	—	—	—

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